WORK

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FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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AN AQUARIUM, WITH OPEN FERNERY AND FOUNTAIN COMBINED.

BY C. MAYNARD WALKER.

THERE are very few people, indeed, who do not regard an aquarium with some degree of pleasure, especially if it be tastefully designed, well made, and kept under conditions favourable to the health of its inmates. At any rate, if the latter condition be fulfilled it is a continual source of interest and pleasure, and I have little doubt that if it were more generally known with what ease and how cheaply a practical worker can construct a really good aquarium, and how readily it may be kept in a healthful and vigorous condition, almost every man of a mechanical turn of mind would have one of his own make. I propose in this article helping any such of our readers to this end by giving complete illustrated instructions based upon actual and long experience. And in connection therewith, the reader will permit me, before going further, to refer to a pleasant recollection of my own. It was in consequence of reading, many years ago when a boy, a short description of how to make an oblong aquarium, which appeared in one of the first numbers of THE QUIVER, that I was led to try my hand

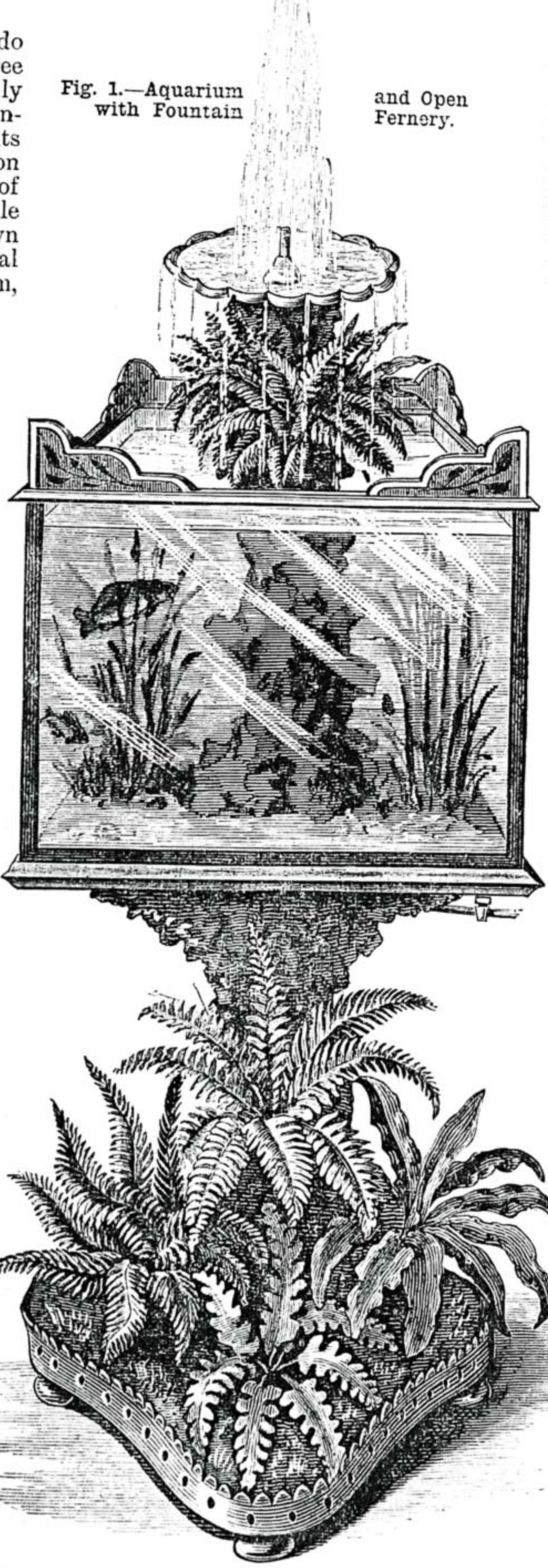

Fig. 1.—Aquarium and Open Fernery with Fountain

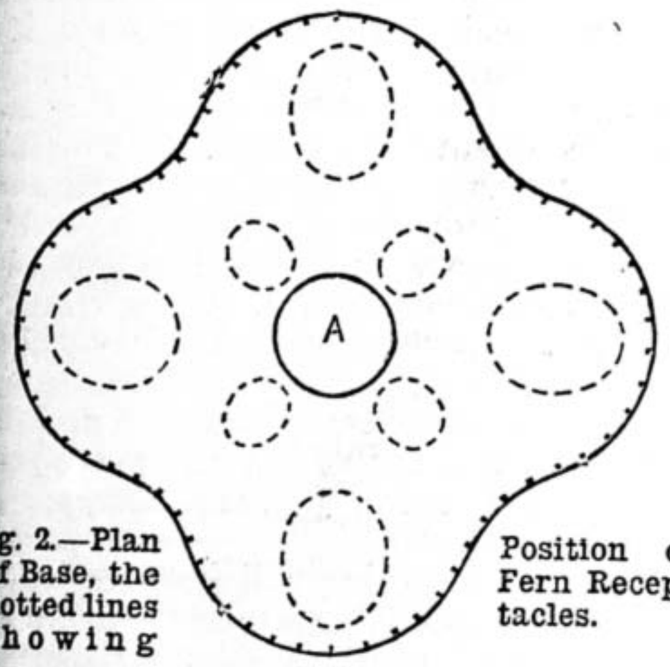

Fig. 2.—Plan of Base, the dotted lines showing Position of Fern Receptacles.

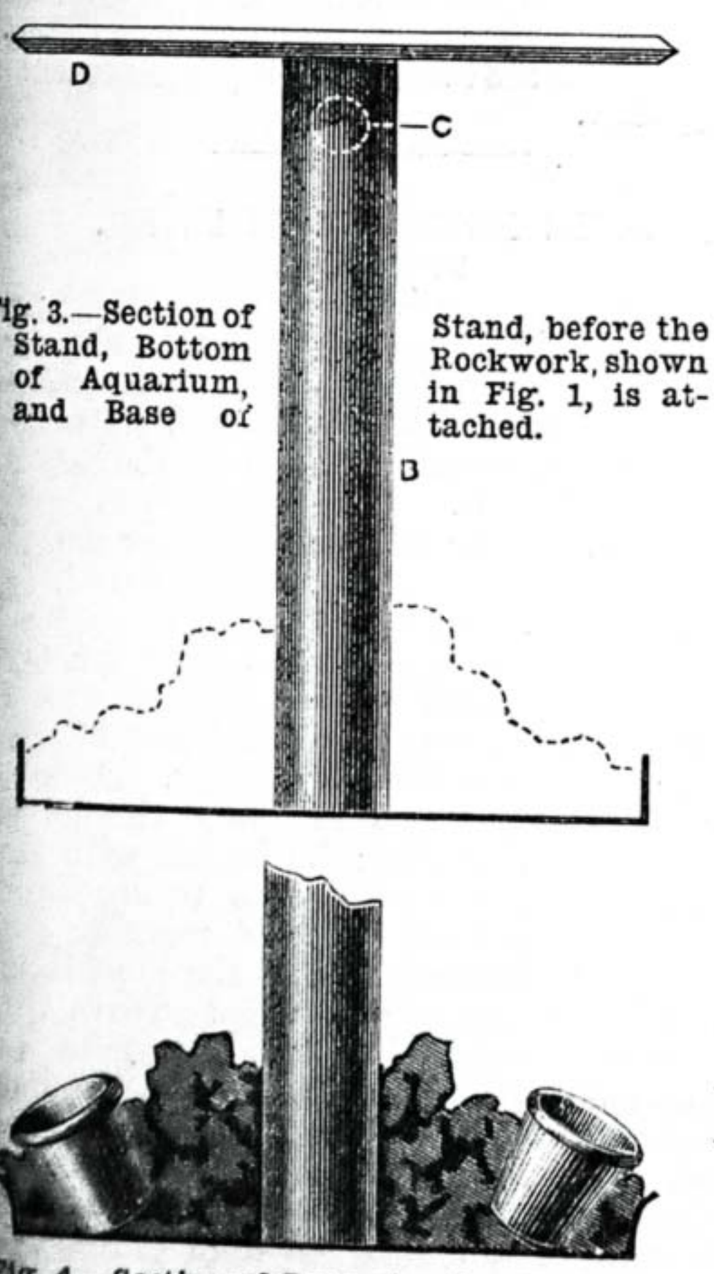

Fig. 3.—Section of Stand, Bottom of Aquarium, and Base of Stand, before the Rockwork, shown in Fig. 1, is attached.

Fig. 4.—Section of Base, showing Method of Building up Rockery for Ferns.

Fig. 5.—Mode of Pocketing Castors before Rockwork is put on. Castors are subsequently bedded in Cement.

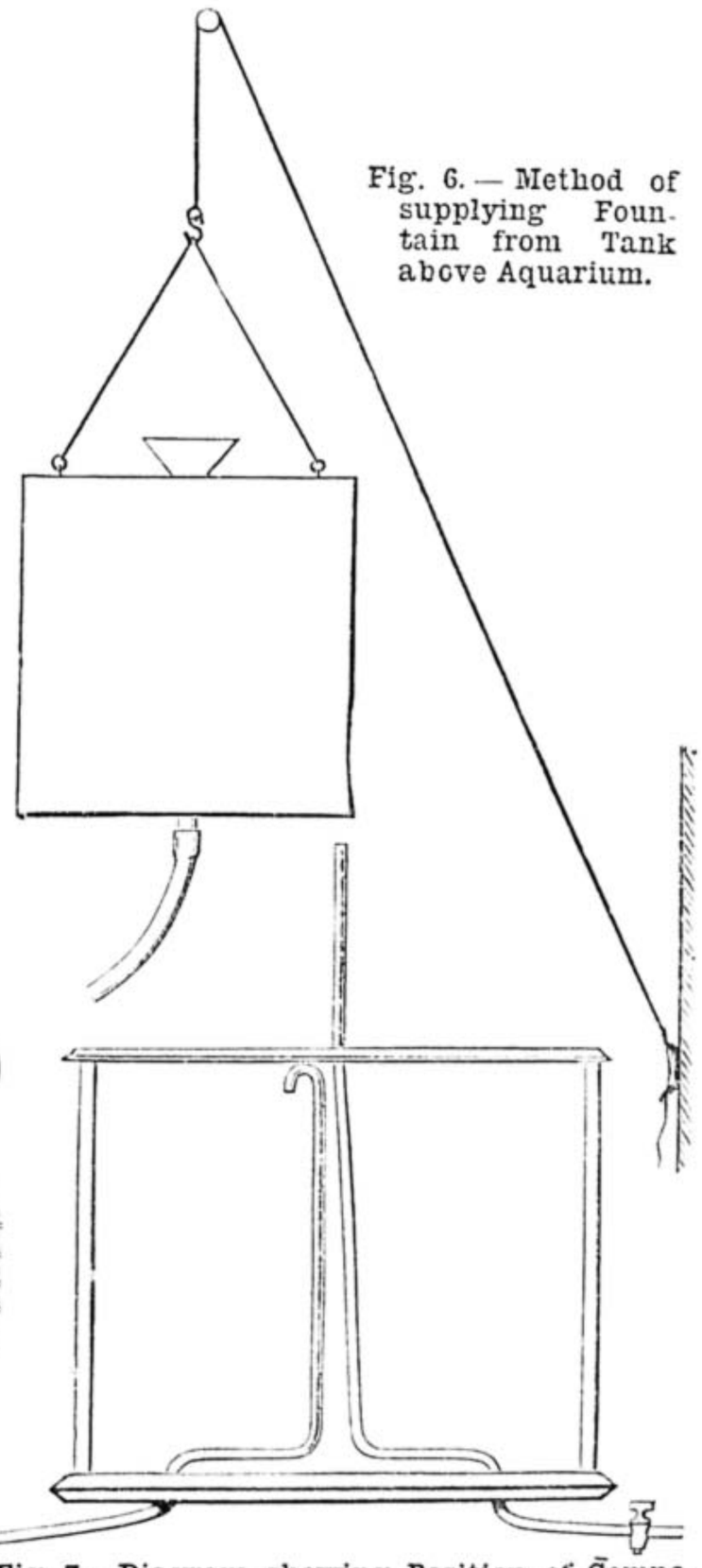

Fig. 6.—Method of supplying Fountain from Tank above Aquarium.

Fig. 7.—Diagram showing Position of Compo Pipes in Central Structure in Aquarium.

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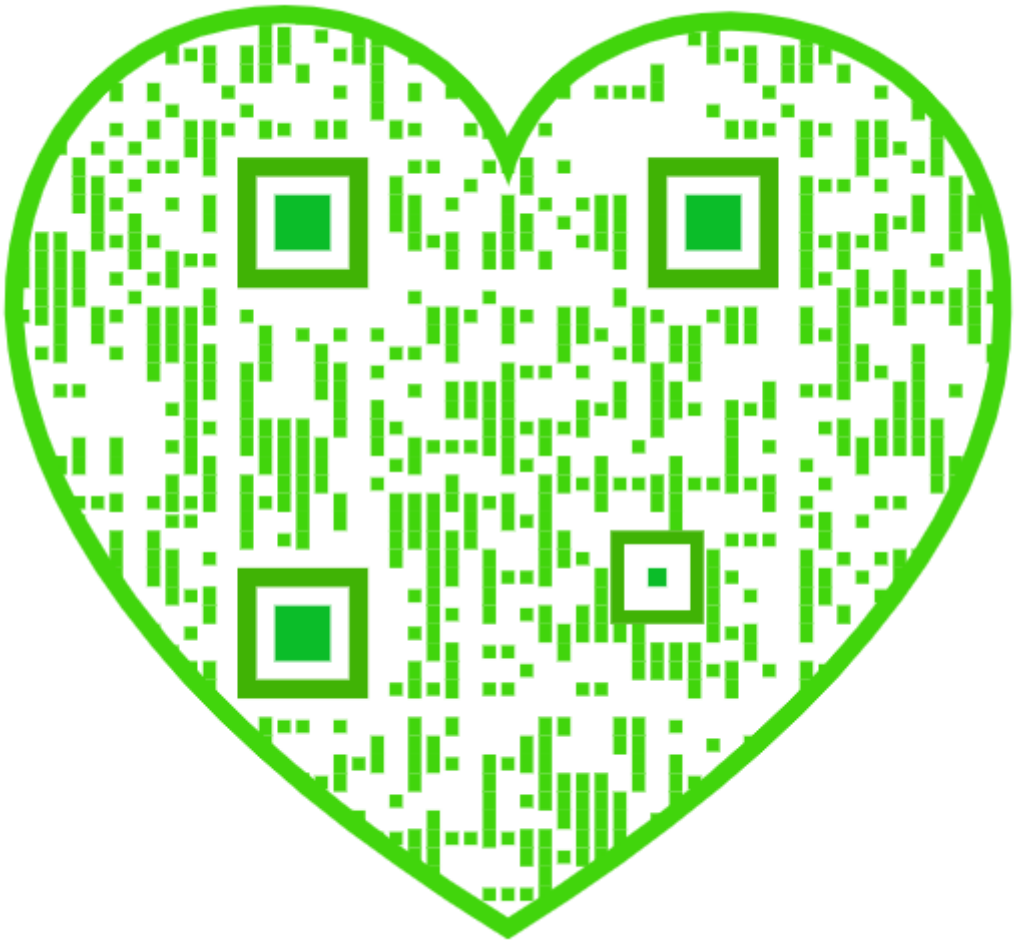

at mechanical work in making an aquarium. Since which time I have made a great many of various kinds. And as The Quiver and Work are both published by the same house, it is, perhaps, not unfitting that the writer should return to the subject in the pages of the latter. From the illustration on page 481 it will be seen that the aquarium under consideration is intended to be a bold and somewhat massive article, suitable for standing in a bay window, the centre of a room, or other position where it can be seen to advantage; and although when finished it will be of considerable size, it will be found that the cost for materials will be very low.

The dimensions are as follows:—Height over all, 4 ft. 4 in.; stand (exclusive of castors), 2 ft. 4 in.; bottom of stand from round to round, 2 ft. 2 in. diameter; from hollow to hollow, 1 ft. 6 in. diameter; height of centre rockwork to under side fountain dish, 1 ft. 10¼ in.; depth of the aquarium proper, 1 ft. 1 in.; width of aquarium at bottom, 1 ft. 7½ in. These dimensions may be varied, of course, to any extent, enlarged or reduced, but to make it much larger it is somewhat difficult to move if required, and again if much smaller the space is cramped; the writer found these dimensions worked up made a most successful affair in every way. The materials used in the construction are mainly zinc, glass, and cemented rockwork. The angle bar and rebated zinc, for making the aquarium frame, can be bought at any zinc workers, or direct from Messrs. Treggon and Co., Limited, Jewin Street, E.C., and the numbers of the various parts used are the numbers used by them in their catalogue. In making up this design make the bottom of the aquarium first: this consists of four equal lengths of No. 7 sash bar, 1 ft. 7½ in. each, and carefully mitred at each end so as to form when soldered up together a perfect square—an ordinary backed saw will do for this conveniently. The worker will observe that the sash bar has on one side a kind of open seam where the two surfaces of the zinc meet, but are not soldered; it is better that for the bottom these should be soldered perfectly tight, after mitreing, so that they must be so cut that this seam meets the seam on the next one; this being done, you have a square frame with a rebate top and bottom. Now cut a square of No. 10 gauge zinc half an inch smaller than the frame and solder the same strongly to the frame; file up and set aside. Now make the base by taking a square of No. 10 zinc, 2 ft. 2½ in. from corner to corner, centre it, and mark a circle of 3 in. diameter on one side. Now mark and cut out the curves as in Fig. 2, and with a hammer raise a ¼-in. edge all round, which will stiffen up the work and make it ready to receive the ornamental border, which is formed of No. 28 fret (Treggon's), and costs about 3d. per foot run; a smaller size is made at about 1½d., but No. 28 is the best, being bold and strong; this must be soldered so as to be water-tight, or the drainage from the ferns will run on to the floor. The castors should now be fixed. It is most important that castors should be used, as in attempting to move the finished work the strain is very great owing to the weight, especially when filled with water, but with castors it is moved quite easily; nor must they be merely tacked on with solder for similar reasons, but should be pocketed, as in Fig. 5. Make four little tubular pockets and solder in to corresponding holes in the zinc; turn over, fill each with Portland cement of a thick cream, and put the screw or screws of the castors therein, and leave to set hard, taking care that all are on the same level. By this means, when the stand is afterwards made up you will have the castors securely held. You will now require to make the upright centre of stand, which is formed by rolling into the form of a tube a length of No. 10 zinc, 2 ft. 4 in. long, so that when soldered up it makes a tube 2 ft. 4 in. by 3 in. diameter. Having previously marked the 3 in. circles on the under side of aquarium bottom and the upper side of base of stand, solder up, Fig. 3, make a hole about 1½ in. at c, and fill up the tube with small pieces of coke, and then pour in until quite full a batter of Portland cement; this when dry will form a practically unbreakable pillar, and when the other parts are made will be as firm as a rock. Solder in the fountain pipes, Fig. 7, and proceed to build up the rockwork of stand. For this purpose you will require some Roman cement and ordinary gas coke; break up the coke into convenient sized pieces and dip them into a thin batter of cement. Why Roman should be used is that it will take a coating of paint, whereas Portland would require long seasoning; but the latter is much stronger, so that if you propose to paint the work use Roman, if not use Portland cement mixed with sharp sand. Set the work on a level place and see that the pillar is perfectly upright and true to the part you are now working upon; that is, you have got the stand upside down, and from about 3 in. of the edge of d are building up a conical rockwork to the pillar, about one-third of its length, as roughly as possible and yet true; as soon as this is set hard, turn the work right way up, on *a level place*. See that each castor touches the surface of the level place, and see that the whole stands upright, square, and true. This is most important, and the work should be done in a place sufficiently large to get round it and see it from all sides, as when once the work has set firm it cannot be altered to set true. Then build up as Fig. 4, first running in about 1¼ in. of Portland cement and sand, which will make a very strong base; get four flower-pots about 4½ in. in diameter, tilt them on side towards the edge, and fill in all around with cemented coke, taking care that all is well cemented together, and presents a nice rustic appearance. Continue the rockwork a few inches above clear of the mouths of the pots, and then take four pots about 3 in. diameter, and tilt outwards in the same way—between each pair of the larger pots; this will give you two tiers of pots; cover the remaining portion of the upright in the same way, let me again say, taking care to well cement all together, as this part requires to be very strongly made. We now require to complete the aquarium frame. Take four lengths of No. 43 sash bar, 18¼ in. each, and mitre to a square, which should be *exactly the size on the inside with the inside of the bottom;* then for the uprights four lengths of No. 46 bar, 12½ in. long, which solder securely to the frame and to the stand, square and true. Bring to the centre your two pieces of compo (⅜), one for supply and the other for waste; and then glaze the frame with 32 oz. sheet glass, set with putty, made of ordinary putty 1 lb., red lead ½ lb., worked up into a paste with gold size sufficient. Then when well set pour into aquarium to about ½ in. up the glass a layer of *Roman* cement; when set, proceed to build up the centre rockwork, for which purpose the two pipes had better be strengthened by putting in a length of the No. 46 bar tied to them. The waste pipe should extend to about ½ in. of the top, and should be bent down again so that its mouth will be under water when in use, an air hole being made in the top of the bend; this prevents floating objects running down the pipe; both pipes should be soldered in bottom zinc about 3½ in. from edge. The centre rockwork is provided with four pots, set as the upper tier in Fig. 4, at such a height that the bottoms are out of water; and above is fixed a glass dish with a hole in, set quite level and made firm with cement on top, the supply pipe being fitted with a jet at this end and a tap at the other or bottom of aquarium. The constructive part is now done with the exception of the corner ornaments of aquarium shown in Fig. 1, formed of the waste pieces of zinc left over cut out with a fret saw.

For finishing, a rich chocolate colour relieved with lines of gold bronze looks well; the rockwork at base looks very effective when painted a dark bronze, and the ragged edges touched up with gold bronze; the rockwork in centre may be tinted with colour mixed with copal varnish, and the inside corners of the glass should be coated with varnish as well as the floor of the aquarium, and when thoroughly dry the bottom may have a layer of washed shingle. No live stock except plants should be put in until the aquarium has become thoroughly seasoned, and it will save a lot of trouble if the work can be left outside exposed to the weather for a few weeks, being frequently emptied in the meantime, and the process of painting the outside deferred until the last. Where it is convenient a supply of water for the fountain direct from the cistern of course is best; but where not, a very simple and handy contrivance, Fig. 6, is very useful. A zinc vessel is suspended from the ceiling on a pulley-wheel, and, fitted with india-rubber pipe attached to the supply, is filled and drawn up, and the water when used runs from the waste pipe into another vessel or jug, and changed as often as desired.

I trust the foregoing will be sufficiently clear in detail to enable any one to make up the design, and would say let no one be deterred from the work, thinking it difficult. It is really quite easy, and the more work there is in it the more value it possesses when completed.

SOME NOTES ON PLANING.

BY B. A. B.

When the beginner has learnt to sharpen his planes according to the instructions recently given in Work, he will naturally want to make some progress in the use of these useful tools.

We will try to understand a plane and its mode of action. The cutting edge is so arranged that the angle is constant; a chisel or gouge can be used in various ways, and held at various inclinations, but the special feature of a plane is that the cutter is fixed by a wedge or a lever and screw. Some of our numerous pupils ask why the joiner uses so many planes; he begins with the jack plane, he then uses the trying plane, and after the work is fitted together and glued up, he commonly uses the smoothing plane. Our pupils say, why? Now, this question is reasonable, and ought to be answered. The jack plane is used first, because it is a plane long enough to give some accuracy of surface; it is generally 17 in. long. It is used to take off the outside surface, and does not need quite such careful sharpening and adjustment as the trying plane, it will do if we take strokes

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of about an arm's length at a time. Now, we may often have very uneven stuff to plane, sometimes slabs axed or adzed into shape, and having an accurately adjusted trying plane; we must take care of it, and economise its use, for the surface of the plane wears uneven on such timber; so our jack plane, which is not called upon for such accuracy, is used first. The trying plane will not then be worn uneven, and it

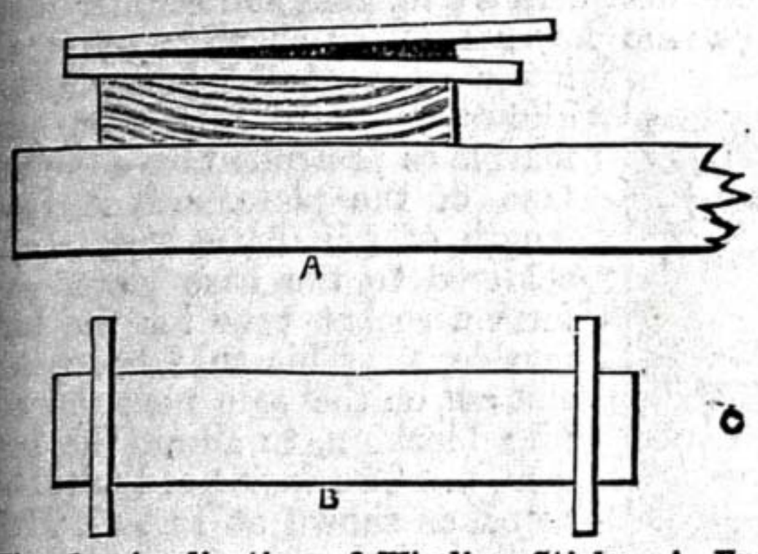

Fig. 1.—Application of Winding Sticks—A, End View. B, Plan. C, Point from which to view.

matters very little if the jack plane is a trifle untrue.

Having reduced the timber to something like accuracy, and also removed the dirt and grit which always deposits upon the surfaces of wood during its exposure for seasoning, and which grit is very destructive to the keenness of the plane iron, with the jack plane, we may take our well-sharpened trying plane and try to obtain a true and finished surface. We shall find it will retain its edge much longer than the jack plane did, because our timber is now clean; and the surface of our trying plane is also likely to retain its accuracy, because our timber is now much less uneven than it was when we began. May I point out the faults a beginner is most likely to reveal as he tries to get his work true? He is extremely likely to take most off the end nearest the bench stop, and he is prone to take most off the corner of the stuff nearest the edge of the bench. This is caused by the fact that the swing of his arms, and, in fact, of his whole body, is in a curved pathway; if he really needs to reduce the front and the near edge, why, certainly; but let him beware of so doing as a mere matter of habit.

Sometimes a piece of wood "lies hollow," as it is often termed, and our beginner may think fit to plane the hollow side first. He begins at the end, and the first stroke sends the wood off the bench, and jerks the plane against the stop, to its probable injury.

We who have seen this will henceforth take care to tuck a thin slip of wood under the end of our stuff, if we *must* plane the hollow side first; if not, we will plane the round side, and if it bends much under our sturdy stroke, we will tuck a piece of thin wood under the middle, taking care that it is not too thick.

We must avoid "winding." What is "winding?" say some of our younger readers. If two of you take a piece of wood in your hands, facing each other, thus :—

Left hand.	Right hand.
Right hand.	Left hand.

Now both raise your left hands and depress your right hands; you thereby compel the piece of wood to be "in winding." Wood often goes "in winding" while drying, and if a door or a shutter is made of winding stuff the consequences are likely to be unpleasant.

Let me explain how to remove this winding. Obtain two pieces of wood about 16 in. long and about 1 in. by ¾ in., dimensions are of no importance so that the pieces are straight and parallel. Lay these "winding sticks" across the work and view them; you will at once see which are the highest corners, which are diagonally opposite each other. (See Fig. 1.) Be sure to reduce the thickest of these if there is any difference. If there is much to plane away, most of it may be done with the jack plane.

After the winding is reduced, most likely the stuff is left rounding in the direction of its length. The remedy is to aim at working hollow, constantly watching the effects of the planing, and remembering that the object is not to make shavings, but to make our piece of wood as perfectly flat as possible.

Let us try to understand the reason of this advice to try to plane hollow.

If we imagine a longitudinal section of a plane from end to end we shall find that the section gives us three points (*not in a straight line*), one point at the junction of the front end and the sole, one at the meeting of the sole and the back, and one at the

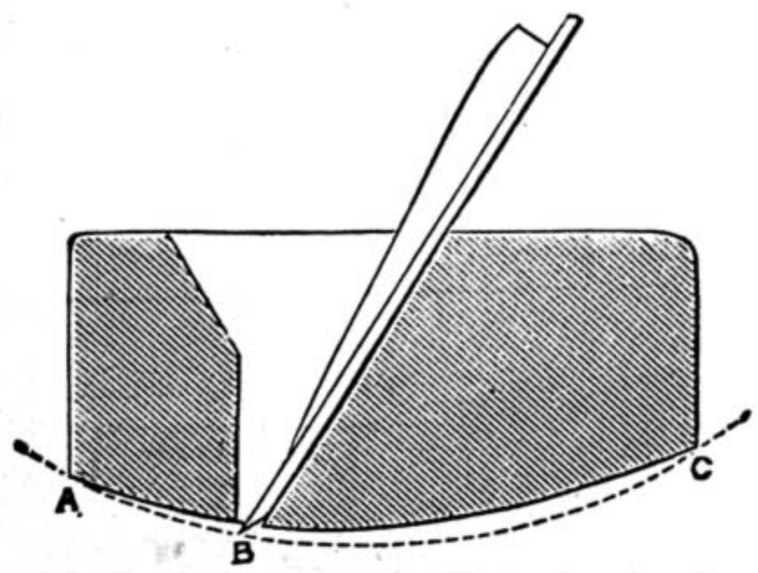

Fig. 2.—Section of Compass Plane, showing three Points, A, B, C, not in a straight line. The dotted curved line is the greatest concavity this Plane will work. Projection of B exaggerated.

point where our section cuts the edge of the cutter, having a projection equal to the shaving we intend to remove. Now, three points not in a straight line must be either the angles of a triangle, or they must lie on the line of a curve. This is what the three points are in the case of a plane; they are in the path of a segment of a circle, whose curvature depends on two conditions: the length of the plane and the projection of the iron. (See Figs. 2 and 3.) Hence a plane can be made about four times as accurate, or rather, one-fourth as defective in accuracy, by halving the projection of the iron. The same increase in accuracy occurs when the length of the plane is sufficiently increased, for we must remember that a plane is an instrument capable of reducing a surface to a small degree of concavity; that is, that although there is scarcely any limit to the convexity that a novice can make with an accurate plane, the most accurate plane ever used on a piece of wood can and often does make a concave surface, and that concavity is limited by the projection of the cutter from a straight line, and the length of the same straight line. In this we must bear in mind that it is longitudinal accuracy we are striving at; the transverse surface of the wood will not be nearly so accurate, however well we may have sharpened our planes, and however carefully set them, inasmuch as the length exceeds the width, so that the truth of our surface will be greater in the direction of the length.

Now, as a truly surfaced plane can make a convex surface (in length), and can make a concave surface, limited as we have seen, we can believe that no tool equally simple and portable can surpass the plane for accuracy of performance.

We are told by opticians that if two flat discs of glass of about equal size are ground together with an abrading substance between, the top one becomes concave and the under one convex; this is just the result of the beginner planing his work—the under surface becomes convex. Now, knowing the amount of hollowing that the plane is capable of is limited, the instructed beginner, however unpractised, sees that to avoid his usual error he must try and plane hollow, limiting the possible error in that direction by having a very slight projection of the cutting edge; the tendency to round off the ends *will* come in, and knowing what to avoid our pupil will be able very speedily to make a fairly flat surface with a good trying plane.

The smoothing plane is small and handy, is easily turned about, and its accommodating shape and size render it fitting for the finishing process, where the trifling use of it is not likely to reduce seriously the accuracy we have attained.

It is most important to so sharpen and set the smoothing plane that the work shall not show plane marks. If the wood has been "tried up" well, probably the mortises and tenons have been truly cut, and the work has been glued up to the workman's satisfaction.

In the final cleaning off, accuracy in sharpening the smoothing plane is most desirable; especially is this the case when the work is to be varnished, for the surface reflecting light as it does, makes every departure from a flat surface most noticeable, and a smoothing plane iron to finish such work (particularly in soft wood where the use of the scraper is out of the question) ought to be very slightly rounded at the corners, enough to avoid the corners projecting from the sole of the plane, and so little as to allow a thin shaving, nearly 2 in. wide, to be taken off with a 2¼ in. plane. Such a plane kept well sharpened and the cap iron within $\frac{1}{16}$ in. of cutter, well screwed together, the wedge fitting well, and care

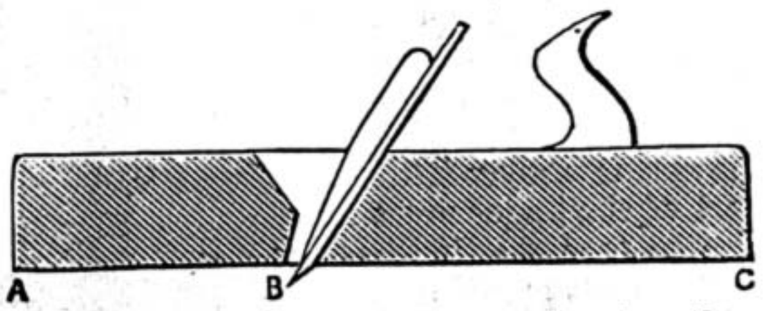

Fig. 3.—Section of Jack Plane, showing three points as in Fig. 1, the depth of curve possible depending upon projection of B. Projection of B exaggerated.

taken to avoid small particles of glue, wood, etc., clinging to the plane, and thereby being forced down on the surface of the work, causing bruises and scratches upon it—such a smoothing plane will leave a surface that will require very little glass-paper to make it fit for the application of paint, polish, or varnish.

My paper may be regarded as affording a simple, but, I trust, clear and intelligible, description of the way to go to work in planing up any piece of wood, and a satisfactory exposition of the reasons for doing so. If beginners in all manual work were thus taught the why and the wherefore of everything that they were told to do, workmen, I think, would be likely to take far more interest in their work than many do at present.

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BURGLAR ALARUMS.

BY GEORGE EDWINSON BONNEY.

CONTACTS—DALE'S DOOR TRIGGER CONTACT—MAYFIELD'S DOOR TRIGGER CONTACT—DOORPOST CONTACTS—WINDOW CONTACTS.

Contacts.—The little pieces of apparatus employed to connect the alarum bell with the battery when a door or window is opened, are named "contacts." In their construction are employed tubes or brackets made of brass; springs of brass, or German silver, or steel; small set screws of brass; and insulating blocks of ebonite. The names given to the various pieces denote their uses and situation. These will be seen as we proceed.

Dale's Door Trigger Contact.—Fig. 44 illustrates a door trigger contact made and sold by Messrs. H. J. Dale & Co. The base is made of ebonite, 3¼ in. by 1¼ in. by ¼ in. Two holes are drilled and countersunk in two opposite corners to receive screws for attaching the base to the door frame. A strip of spring brass or German silver, 3 in. by ½ in., is fastened by two screws to the upper part of the base. One of these screws is fitted with a brass collar or washer, and to this one of the branch wires is connected. The strip is bent upward to form a curved spring, and a ¼ in. speck of platinum foil is soldered to the spot where it will make contact with the trigger, in the centre of the strip about ½ in. from the free end. A brass trigger (shape and size shown in the illustration) is loosely held by a pin in a small brass bracket, as shown in the figure. This hangs down perpendicularly, with the finger of the trigger free from contact when the base is fixed to the door frame over the door. On opening the door, its upper part engages with the wedge-shaped piece hanging over it, and the trigger acts like a lever with its finger making contact with the spring above. This part of the finger must also be furnished with a strip of platinum foil soldered to it. As the door is pushed open, its upper edge passes the lower part of the trigger, and this falls down again, out of contact with the spring. The other branch wire is connected to the set screw seen on the left side of the bracket. The bell is set ringing as soon as the trigger comes in contact with the spring. It will be understood that this appliance must be fixed to the door frame *over* the door, in such a position as to bring the top of the door in contact with the lower end of the trigger as the door opens. As the door shuts, it passes under the trigger, but does not bring it in contact with the spring.

Mayfield's Door Trigger Contact.—Fig. 45 shows another variety of door trigger contact, made and sold by Messrs. Mayfield, Cobb, & Co., 41, Queen Victoria Street, E.C. It is composed of an angle-shaped brass bracket (D), made out of a piece of brass 2 in. by ¾ in. by 1/16 in., bent at right angles, and drilled with suitable holes for screws, as shown in sketch. To this is attached by screws (the tips of which hold the insulating ebonite block shown) a strip of spring brass or German silver, 3 in. by ¾ in. (B), in which is cut a slot ⅛ in. by ½ in. to receive the wedge-shaped piece of brass, C. This piece of brass is hinged to a small piece of brass soldered to the spring, B, at one end of the slot as shown, and, when thus attached to the spring, the wedge is free to move up through the slot when the top of the door presses against it whilst being shut, but is fixed against the spring when the door is pushed open. The top of the door must, therefore, push the spring upward and bring it in contact with the spring, A, above. This upper spring is made of the same material as the lower spring, but it is fixed to the ebonite block, and is thus insulated from the bracket. The end is also pointed, and bent down so as to nearly touch the end of B; at this point of contact both springs are protected with a speck of platinum on each. One of the branch-line wires is fastened to a screw on the heel of A, and the other wire to the set screw on the bracket, D. This trigger is also fixed *over* the door, as the last-mentioned.

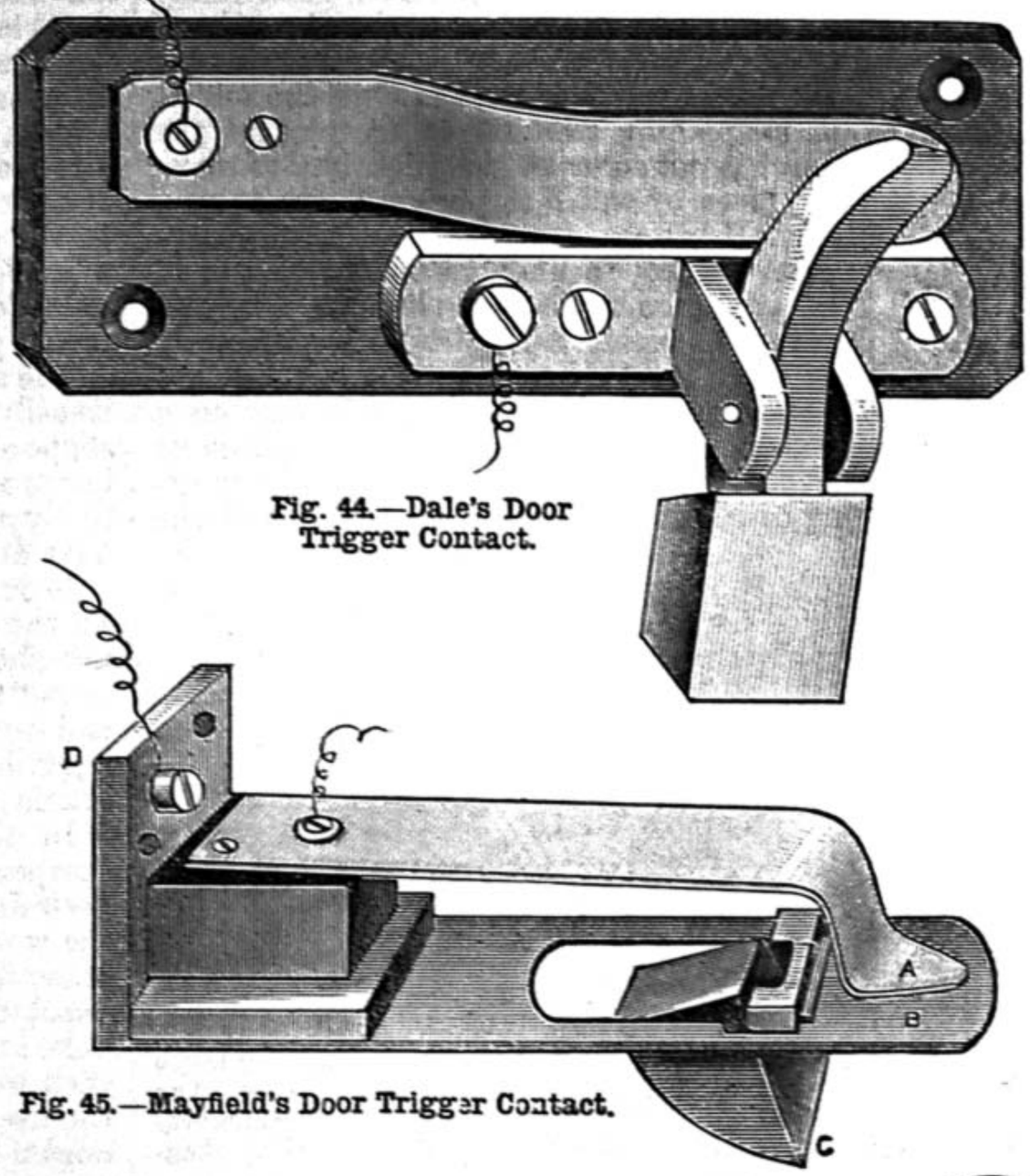

Fig. 44.—Dale's Door Trigger Contact.

Fig. 45.—Mayfield's Door Trigger Contact.

Doorpost Contacts.—Fig. 46 illustrates a form of doorpost contact made and sold by vendors of electric sundries generally. It is made up of (1) a brass plate (A), 2¾ in. by 1 in. by 1/16 in., with a hole drilled and countersunk in each end to receive the screws which fasten it to the doorpost. Half an inch from one end, drill a ⅜ in. hole, and countersink it on the lower side, or chamfer away the lower edge of the hole until it allows one-third of a ¾ in. brass marble to protrude above the surface of the plate. (2) A 1½ in. length of ¾ in. brass barrel (C) is soldered to the base plate, A, to form a socket tube for the brass marble, B. This tube has a ¼ in. slot cut on the side next the ebonite block, E, to admit the brass cam, D. The inside of the tube is fitted, as shown at Fig. 47, with a strong spiral spring, surrounding a ½ in. brass plunger, to the top of which is soldered the brass cam, D. The tube is stoppered at its bottom end with a disc of brass, kept in place by two or three small screws through the side of the tube. On this bottom rests the end of the spiral spring, and to this is fastened one of the branch wires by the set screw shown in both figures. (3) A block of ebonite 1⅛ in. by ¾ in. by ½ in. (E), cut to the shape shown at Fig. 48, to fit one side of the brass tube, is now to be attached by two screws to the base plate, A. Across this obliquely, as shown in Fig. 48, is fixed a small slip of thin brass, with a speck of platinum foil soldered to the spot where it will come into contact with the corresponding speck of platinum soldered to the upper part of the cam, D, as shown at Fig. 47. To this strip of brass is attached the other branch line. Fig. 49 illustrates another variety of the same appliance, of smaller size, and with a rounded head of brass to the plunger and cam, instead of a brass marble, as at Fig. 46. Let us now see how these contacts are placed in action, and fixed to the door. A hole is drilled in the rebate of the hind doorpost, at any convenient position, to receive the barrel of the instrument. This hole should be sunk deeper than the length of the barrel, to allow for recessing the base plate and give freedom to the set screw at the bottom of the barrel. When this is done, a recess must be cut with a firmer chisel to receive the ebonite block, E, and allow free play to the cam, D. Then the shape and size of the base plate must be marked, and a recess cut to receive it, flush with the surface of the rebate. The branch wires should now be brought into the recess from bottom and side by small holes, and attached in position. See that they are both covered up to the last ½ in. (which

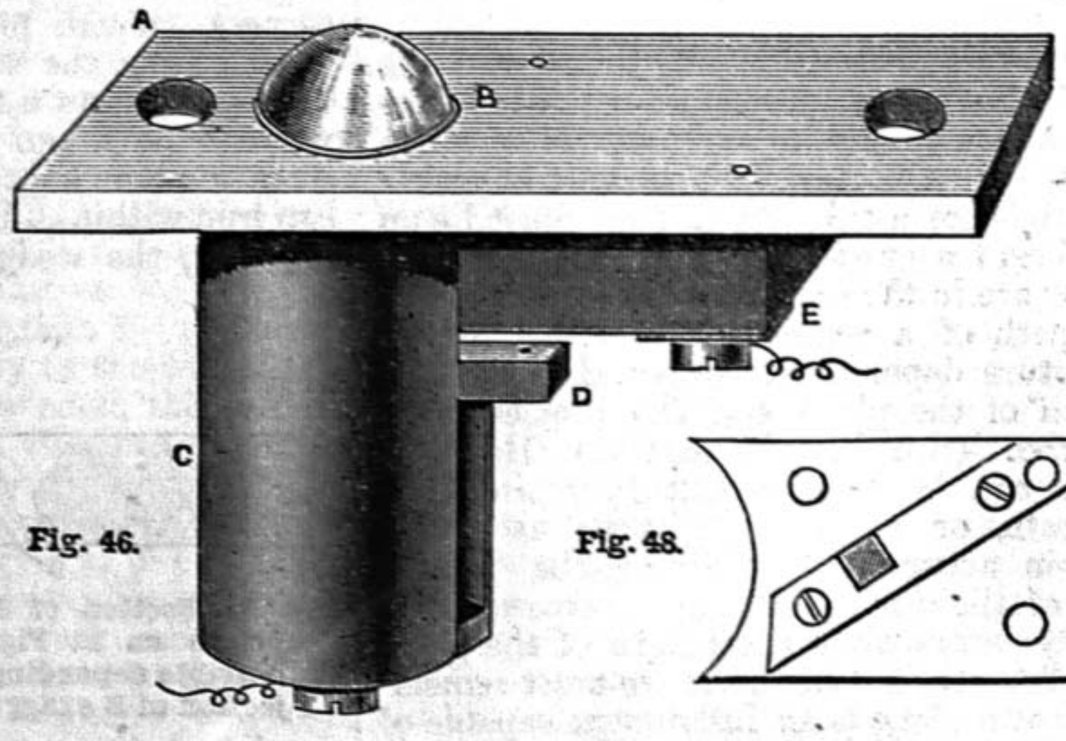

Fig. 46.

Fig. 48.

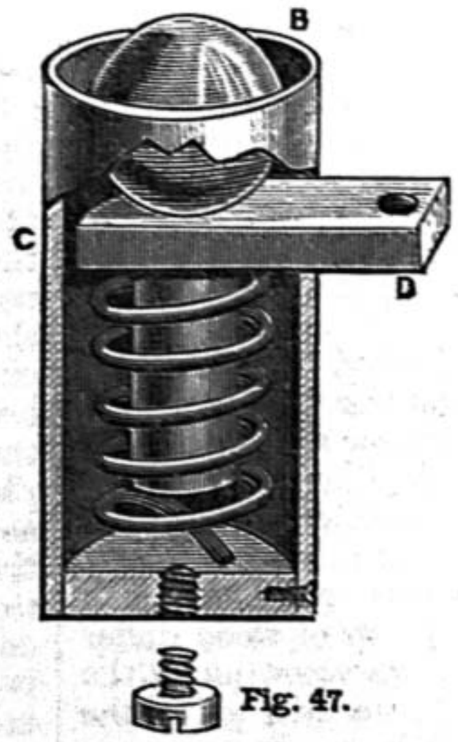

Fig. 47.

Fig. 46.—Doorpost Contact. Fig. 47.—Section of Doorpost Contact. Block, E, in Fig. 46. Fig. 48.—Plan of Ebonite

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must be bared to attach the naked wires to the screws), to avoid accidental contact with the barrel. Then screw on the appliance, and make all good. If we now close the door, its back style will press on the marble and force the cam, D, out of contact with the brass strip on E. Whilst in this position, the circuit of the alarum bell is open, and the bell will not ring; but as soon as the door is open only a little way, the spiral spring will force the cam, D, again into contact and close the circuit. If we left the appliance in the condition it now is in, it would soon get out of order, because the brass marble would wear for itself a recess in the back of the door style. It is usual, therefore, to recess a small brass plate in the style where it comes into contact with the marble, as shown at Fig. 50. A similar appliance, of smaller dimensions, to suit the size of door, may be used for cupboards or French windows.

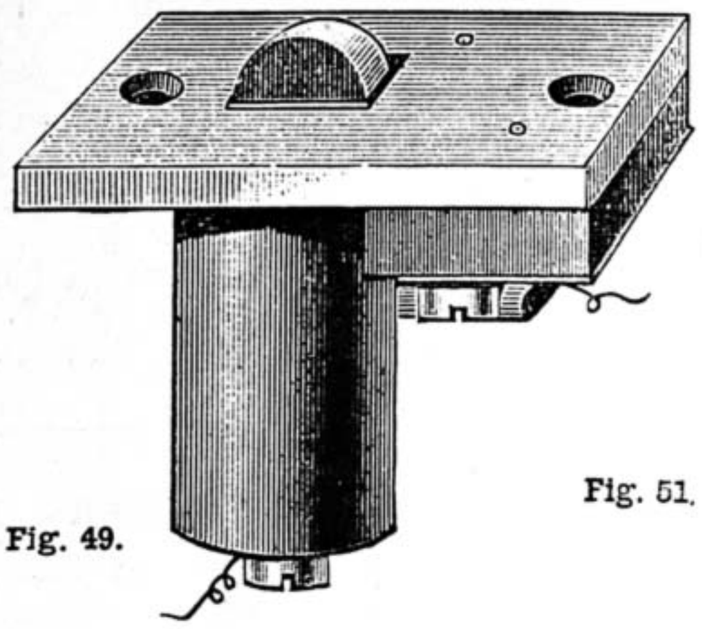

Fig. 49.

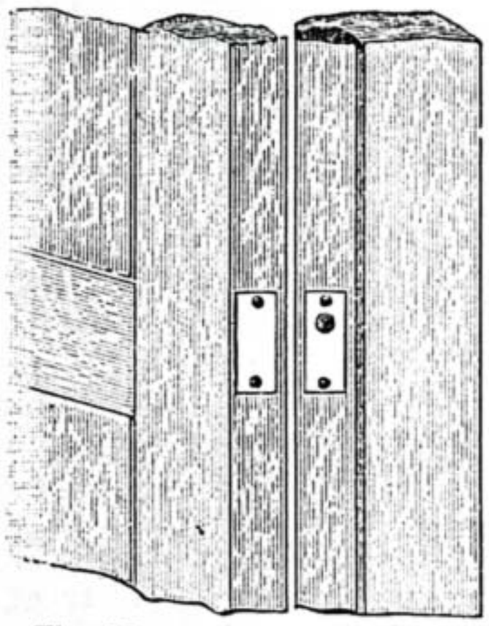

Fig. 50.

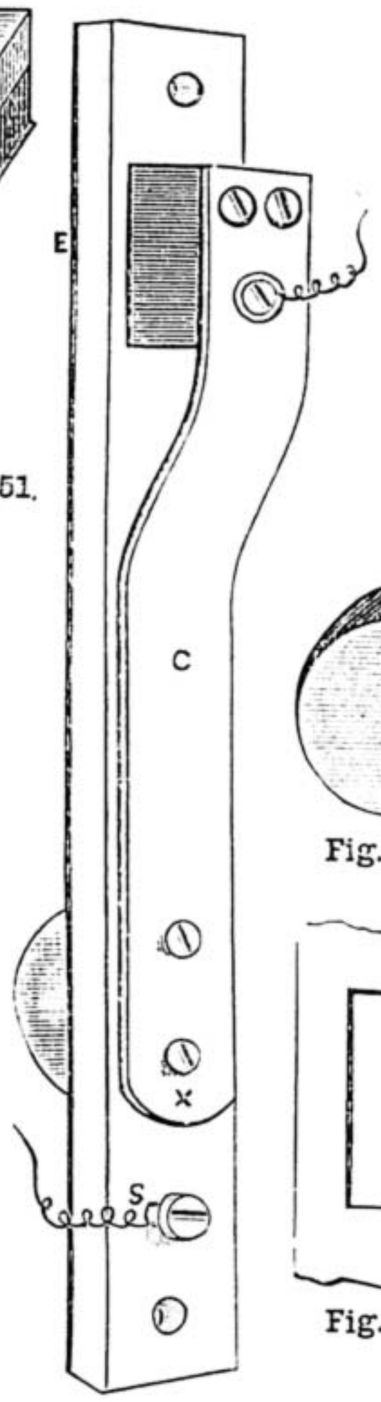

Fig. 51.

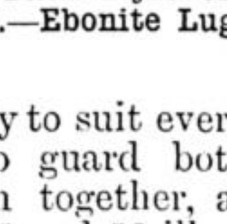

Fig. 51 B.

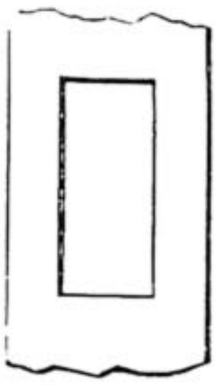

Fig. 51 A.

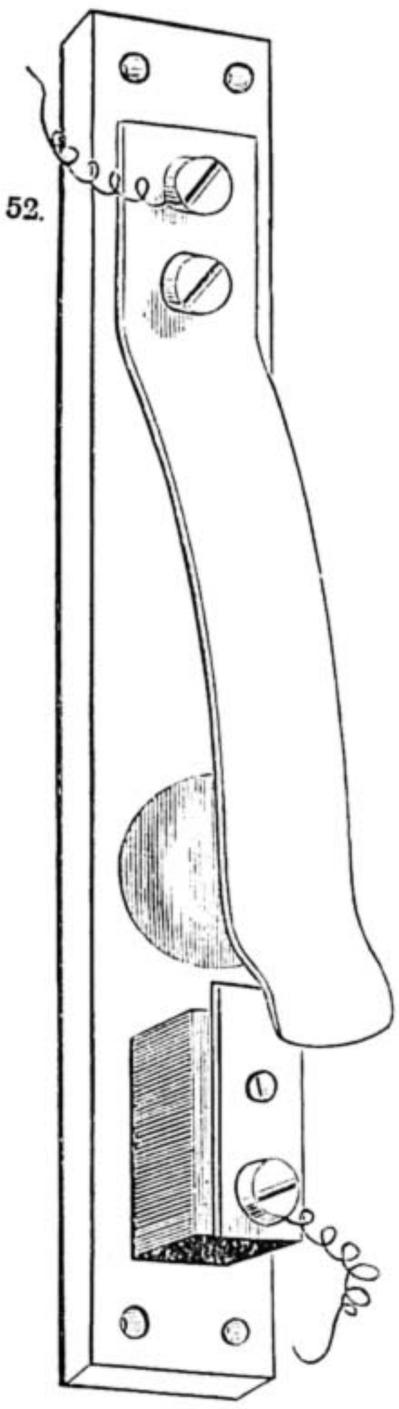

Fig. 52.

Fig. 49.—Small Doorpost Contact. Fig. 50.—Piece of Door Frame and Door, showing how to fix Doorpost Contact and Plate to Rebate of Frame and Back Style of Door. Fig. 51.—Window Contact. Fig. 51 A.—Slot for Ebonite Lug. Fig. 51 B.—Ebonite Lug. Fig. 52.—Window Contact—Ball Pattern.

Window Contacts.—Windows are generally considered to be the most vulnerable part of the house defences. Burglars enter more frequently by windows than doors, because they can be opened with least force and least noise. Window contacts are, therefore, made in great variety to suit every probable contingency, and to guard both bottom or top sash, or both together, as occasion may require. Figs. 51 and 52 illustrate a window contact of easy and simple construction for fixing in the rebate of a window frame to either top or bottom sash, or both. The appliance shown at Fig. 51 is made up of (1) a base plate of brass, 4 in. by $\frac{5}{8}$ in. by $\frac{1}{8}$ in. A small hole (for screws to fix it) is drilled at each end, as shown, and countersunk on the face of the plate. Another small hole is drilled and tapped to receive the set screw, S. At a distance of 1 in. from one end is cut the slot shown at Fig. 51A. This slot will receive the ebonite lug shown at Fig. 51B when this has been fixed to the spring. (2) An ebonite block (E) $\frac{5}{8}$ in. by $\frac{1}{2}$ in. by $\frac{1}{4}$ in., to be fastened to the base plate by short brass screws to form an insulating block for the spring, C. (3) A strip of spring brass or German silver 3 in. by $\frac{1}{2}$ in., to form the spring, C. The form of this and the method of fastening it to the insulating block are clearly shown in the sketch. The point of contact between this spring and the base plate may be at the tip of the spring figure or at the inner side of the lug, the exact spot being determined by bending the spring so as to touch this spot alone when the spring closes. This point must be protected with a speck of platinum or a small pin of this metal on both base plate and spring. The insulating lug, 51B, is then to be cut out of

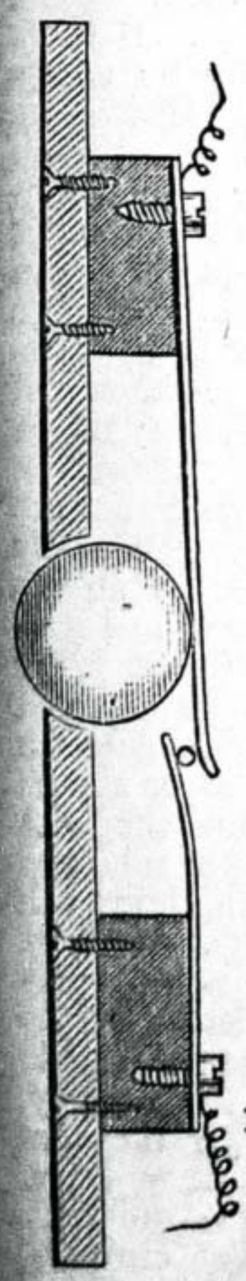

Fig. 53.

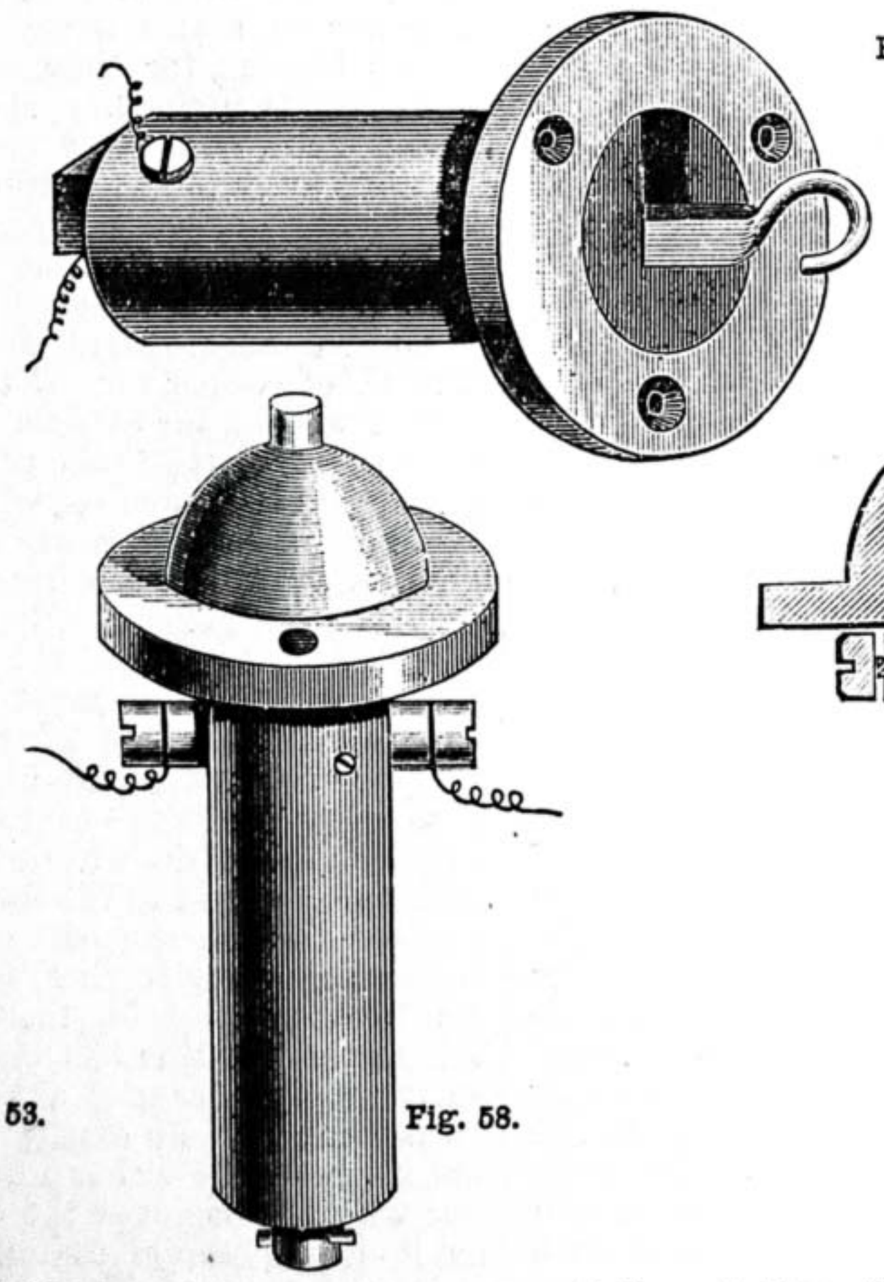

Fig. 58.

Fig. 54.

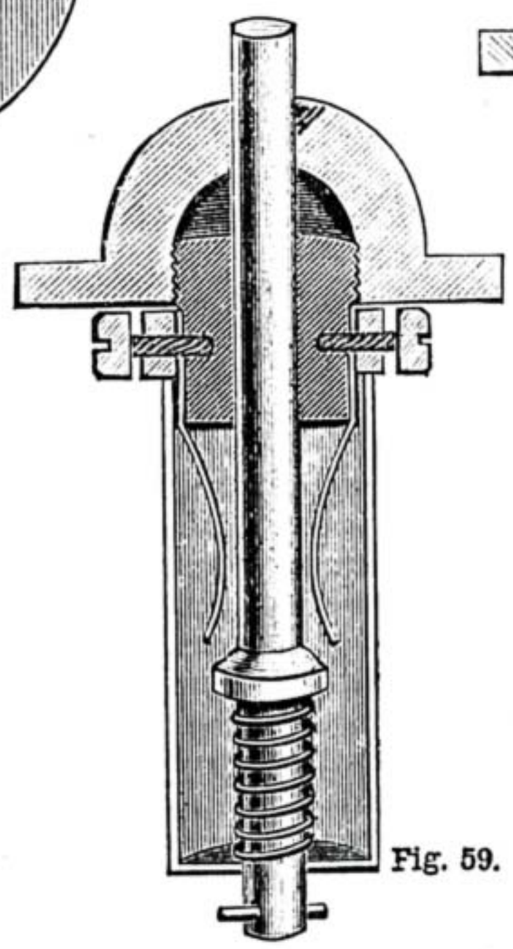

Fig. 59.

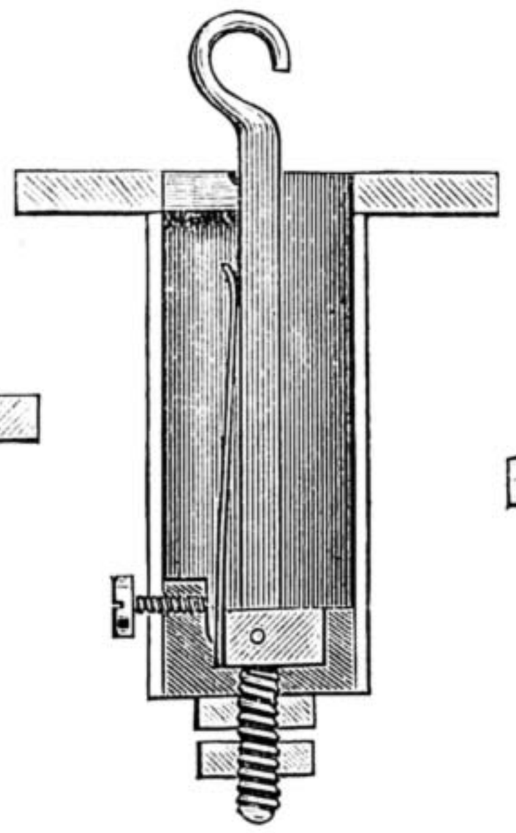

Fig. 55.

Fig. 56.

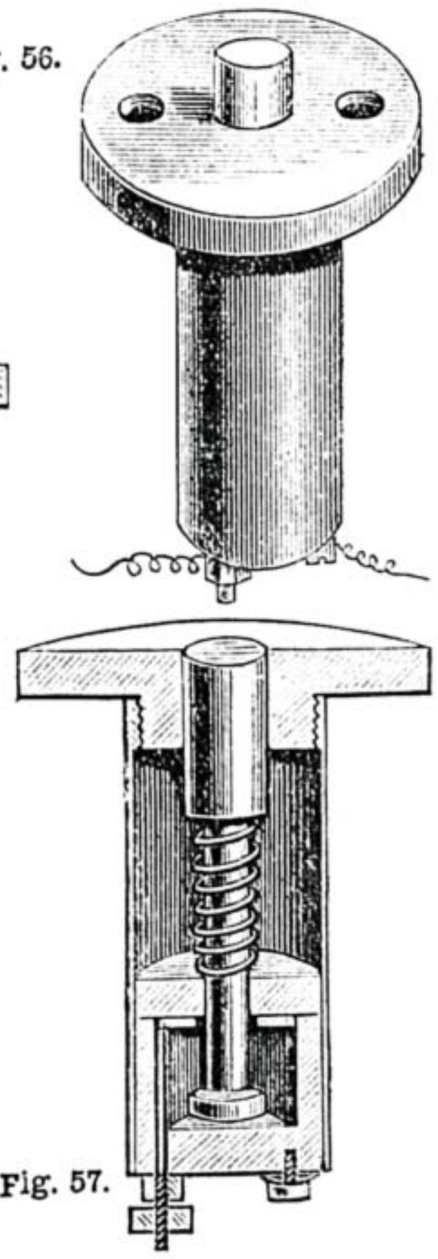

Fig. 57.

Fig. 53.—Improved Window Contact, with Rubbing Action: Section. Fig. 54.—Legge's Window Blind Contact. Fig. 55.—Section of Window Blind Contact. Fig. 56.—Dale's Bottom Sash Contact. Fig. 57.—Section of Bottom Sash Contact. Fig. 58.—Mayfield's Bottom Sash Contact. Fig. 59.—Section of Mayfield's Bottom Sash Contact.

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ebonite to the form shown, and of a size to easily slip in and out of the slot in the base plate, whilst the rounded part should be made quite smooth. It is then attached to the spring by small brass screws, as shown.

Fig. 52 shows another variety of this appliance with a marble recessed in the back of the base plate, and kept in the recess by means of the contact spring. This appliance works in a manner similar to that of the doorpost contact (Fig. 46). The point of contact is between the bent tip of the spring and a thin plate of brass on the insulating block. This arrangement gives a certain amount of flexibility to the contact, with a slight rubbing motion, a thing much to be desired in all contacts, to ensure clean bright surfaces at these parts, free from dust. At Fig. 53 is shown in section a modified improvement of Fig. 52, furnished with a rubbing contact. Messrs. H. J. Dale & Co. sell a contact of the form shown at Fig. 51, with all the working parts enclosed in a shoe made of brass and hard wood to protect those parts from dust and damp and other injury. These contacts are neatly recessed in the rebate of the window frame, with the base plate flush with the surface of the rebate, and the recess made deep enough to allow the spring freedom to move. The wires must be brought into the recess through fine holes bored in the frame, where the sash will not come into contact with them.

A very simple, effective, and cheap form of window contact may be constructed by any person familiar with the use of carpenter's tools. A thin plate or strip of copper or brass is recessed in each rebate flush with the surface, 3 in. from the bottom of the lower sash on each side, and also 3 in. from the top of the upper sash on each side, or four plates altogether. The top and bottom plates on each side must be connected to one branch wire, and the top and bottom plates on the other side to the other branch wire. At the top of the top sash at one side, close to the sash cord, fix a curved spring of brass or German silver, and a similar spring to the other side. Connect these together with a piece of cotton-covered No. 18 copper wire, buried in a saw cut along the top of the sash, then puttied and painted. Fix two similar springs to the bottom of the bottom sash, and connect them in a similar manner. When a window is thus guarded, it may be left open some 2 or 3 in. top and bottom (as recommended by Dr. Allinson) without incurring any danger from the entry of unannounced burglars, for, should the thief be tempted by the partly open window to lift it a little higher, or pull down the top sash a little lower, he will bring the springs on the sashes into contact with the plates on each side, and close the circuit of the bell through the wire running along through the top or the bottom of the sash. A similar result is attained by fixing a contact made up of two curved springs, on an insulated base, in the rebate on one side top and bottom, and a connecting bar to the sash. One wire is connected to one spring, and the other wire to the other spring. When the sash is opened wide enough, the connecting transverse bar comes into contact with the springs, and closes the circuit. Contacts for this purpose are sold by Messrs. Mayfield, Cobb, & Co., at 3s. 6d. each.

Should the householder wish to throw open the sashes of his window and draw the Venetian blinds to keep the rooms cool, he can still guard them against intrusion by using Legge's Window Blind Contact, sold by Messrs. T. Gent & Co., Faraday Works, Braunstone Gate, Leicester, at 3s. 6d. each, and illustrated at Figs. 54 and 55. From these sketches it will be seen that the contact must be recessed in the lower part of the window frame with the point of the hook pointing downward. A loop of cord from the blind is passed over this hook when the blind is drawn. Should any person try to raise the blind, the hook will be brought into contact with the metal frame of the appliance and ring the bell.

Fig. 56 illustrates a contact for the bottom sash of a window, made and sold by Messrs. H. J. Dale & Co. Fig. 57 gives a sectional view of the interior, from which it will be seen that the appliance differs in construction from the contacts usually met with. The cap is turned to fit the top of the pin plunger, and is screwed into the top of the barrel to give firmness to this part. Below the head of the pin a spiral spring of brass rests on an ebonite or vulcanite collar, and this spring brings the lower part of the pin in connection with a wire ring below the collar when pressure is withdrawn from the head. This ring is the continuation of a wire which is screwed at the outer end to receive two small connecting nuts. Both ring and wire are held in an insulating chamber of ebonite. A small piece of the bottom of the barrel is bent over the plug of ebonite, and this holds a small set screw to connect one of the wires. It will thus be seen at a glance that all contacts are secure from dust and damp.

Fig. 58 illustrates a contact made for a similar purpose, and sold by Messrs. Mayfield, Cobb, & Co. Fig. 59 gives a sectional view of the interior. This contact presents the novelty of a domed cap, turned to fit the neck of the pin plunger, and screwed inside to fit threads cut on the top part of the barrel. This is made of ebonite, carrying two curved springs of brass or German silver. These springs are insulated from each other by the ebonite top of the barrel. A brass collar is fitted on the pin plunger, and the bevelled edge of this is brought into contact with the springs above when pressed upward by the stout spiral spring beneath, thus closing the bell circuit. The top of the metal barrel is cut away on each side to clear the small binding screws and tops of the springs on each side. The makers claim that this appliance is perfectly damp and dust-proof, and cannot be tampered with by the burglar outside the window. It is fixed (like that shown at Fig. 56) in the bottom frame of the window, so that the lower sash, when closed, shall press on the pin and keep the collar on the plunger from touching the springs. The flanges of the cap are let in flush with the frame, and a hollow is made in the under-part of the sash to fit down closely over the dome. A short brass screw should be inserted in the deepest part of this hollow to press on the head of the pin, and prevent it from wearing a hole in the sash. It will be seen that this appliance meets the requirement of a rubbing contact, and therefore all these parts are kept bright by use.

Readers making their own contacts from the description of them given here, will be able to get the materials from any dealer in electrical instruments. Those I have described are excellent specimens of workmanship, and are made strong, as if to last a lifetime. Nothing less than good material and good fitting should be employed in making these little useful appliances, and all points of contact must be protected with platinum, to prevent the brass from being burnt away by the electric spark which is always caused at these points when contact is broken.

In attaching the wires, see that they are neatly hidden from view, not only to avoid vulgar obtrusiveness, but also to prevent the wires from being broken or being tampered with.

In my next, I hope to show a few traps and dodges to foil the wily burglar, who may know how to damage the ordinary contacts.

BLISTERS IN VENEERING.

BY DAVID ADAMSON.

Let us take blisters, as the swellings resulting from imperfect adhesion of the veneer to its base are called. These naturally are not so likely to occur with caul-laid as with hammer-laid work, still, unless the novice is particularly fortunate he cannot hope to escape them altogether, and they should never be allowed to remain. The sooner they are laid the better, as if the glue has got quite hard and dry, it is a troublesome matter to get them down. The first care after removing veneered work from the caul should be to look out for blisters, and the same may be said before working any surface laid with the hammer. Sometimes the blisters may be so big as to be easily observable with the eye, but it is hardly safe to trust to this, and because anything looks right to pass it as being really so. Blisters may frequently be detected by passing the hand over the surface, but the most reliable and the most common way is to gently tap the veneer with a light hammer head or something of the kind. The hollow sound which is heard when a blister is struck soon shows there is something wrong, and by going over the whole surface carefully all that there may be can easily be discerned. If the novice should fail to discover any difference in the sound wherever the veneer is tapped, he may conclude that it is down everywhere, though of course it may be his want of training which causes him not to notice faulty places. If there are no blisters, for these are by no means necessary though they should always be watched for, he may be very well satisfied. If there are, they will probably show themselves later on, especially when the wood is polished, as very trifling inequalities can then be much more clearly seen.

To give minute directions for laying blisters is, of course, out of the question, and were I writing for experts only, they might very well be left to take care of themselves, and even many novices, who, when they are reminded that blisters are either caused by air between the two surfaces or by an excess of glue, generally the former however, will be able to reduce them without being told how. Still, it must not be assumed that all readers are gifted with such an unusual amount of intelligence—or should I not say conceit?—as to think they can know what to do without being told, and those who attend to the following hints will probably obtain the best results. Perhaps, before going any further, some novices may want to know how big these blisters usually are, as the question has been asked. I am sorry to say I cannot answer it definitely. In the hands of an expert worker they are not likely to be either numerous or large, but with the beginner the case is different, as it is impossible to tell what errors of judgment or manipulation he may not have fallen into. It may even turn out that his

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veneered work is almost one big blister, and that comparatively little of the work is properly stuck. To give some idea of an ordinary blister, I should say that one the size of a threepenny-bit was small, and that anything over an inch or so across was a tidy size, not quite good enough to take a first-class prize for quality, but quite good enough to take a Liverpool exhibition medal if put in competition and properly arranged. This, of course, does not imply that it is a tip-top blister in point of size, but merely that there are some of less magnitude. It is not, however, the blister but its absence which is desirable. If it is caused by a simple air bubble, it may be laid by pricking a hole in the veneer and pressing this down with an iron warmed sufficiently to melt the glue, the pressure, of course, being retained till the glue has set again. This, of course, is on the assumption that the blister is caused by the air alone, and that there is just the right quantity of glue to do what is necessary. If there is too much glue under the blistered part, it must be squeezed out, the expressive term of "bleeding a blister" being often used to designate this piece of work. The blister must be cut with a sharp edge or point of a knife in order to afford a passage for the glue, which must be first melted and then pressed out with a hot iron. A warmed hammer head, in the absence of anything more suitable, will do very well. Generally the blister will lie flat enough, but in case it does not the cut may be slightly enlarged. Another plan which may be mentioned is to prick a series of holes round near the edge of the blister, and then proceed as before. On a dark veneer it is of very small consequence which way the blister is punctured, but some caution is necessary with the lighter kinds, and I am disposed to favour bleeding by a cut, which, if judiciously made, may almost escape notice or be mistaken for an accidental marking of the figure. The marks caused by pricking round the blister are far more likely to attract unpleasant comment. If the glue has perished, that is, if there is none under a blister, as may happen from a variety of causes, of course some must be inserted, which will be found rather more difficult than taking it out. Even if the glue remains, but has become so dry that heat does not soften it, it will be a job requiring some nicety to moisten it and lay the blister properly. The best way, perhaps, is to prick some moisture in, and then when the glue is sufficiently soft, proceed as before. Blisters, however, should be detected long before the glue has become so hard as to require more moisture, and the last hint will be more useful to indicate to those who have to lay any that may have accidentally been found on old work—to wit, on the aforesaid washstand top. If the blister can be easily reached by a small caul, or, rather, if this can easily be subjected to pressure, it will be found a good plan to lay it in one. The caul, of course, should not be larger than just enough to overlap the blister, as no good and much harm might result from the glue elsewhere being remelted or softened.

A caul for curved work may now be considered, as the nature and work of a caul ought to be pretty well understood from the foregoing. Of course, for plain curves such as a straight cornice-moulding or anything of that kind, there is not much difficulty in forming a suitable caul, but one occasionally meets with some surfaces which, unless they are to be done in considerable quantities, it is practically impossible in the ordinary course of work to make rigid cauls for. The hammer may be, and often is, satisfactorily used in such cases, but when the curves are in all manner of directions a different mode of working must be adopted. The caul, instead of being firm and rigid, must be flexible without being elastic. In other words it must fit itself into every modulation of surface, but should not be compressible by any part of the veneer which may have a tendency to rise. Many substances might be named, but none are more suitable and generally convenient than sand. A bag large enough to cover the work, and of some close material which will not allow the sand to pass through it, must be prepared. This is then filled and heated when required for use. It takes the place of the metal caul, and must be braced up as may be best with pieces of wood which will be fixed down with hand cramps. On the way in which such a caul is clamped down much of its efficacy depends. By the amateur it will seldom be required—nor does the professional worker, with the present fashions in furniture, require it often. Still, there is no knowing how soon styles may not change, and the thorough tradesman ought to be ready for anything that may turn up in his own line of business.

Occasionally, with very sharp curved surfaces, such for instance as a pillar or a column, it may be necessary, to prevent the veneer from splitting, to mount it on thin canvas or something of the sort, but this is so very rarely done that it may almost be regarded as a bit of superfluous instruction to mention it. The sand-caul may be used in all such cases, but where such a thing as a column is being veneered, the wood and hand screws may give way to some binding, such as ordinary chair-webbing, which may be tightly wound round the work. One writer on veneering states that the webbing may be wrapped round the work without a caul, and that by damping and consequently shrinking the binding, pressure will be increased. I don't know that I have seen this plan adopted, but it may be, and as the writer referred to knew what he was writing about, it can only be considered as a practical suggestion not to be despised in case of need.

As marqueterie inlays, *i.e.*, inlaid veneers, are now very much used, it may be said that they should be laid with a caul. Pressure and rubbing with the hammer would be apt to disturb the small inlaid pieces, besides which there are other practical objections.

On panels, square pilasters, or parts of framing where a single line or two of inlaid stringing are required, the veneer may be laid entire and the space for the stringings be scratched out afterwards, in the case of narrow lines the scratch-cutter being just the width of the stringings. Veneered mouldings on the edges of furniture are now so seldom seen that special directions may well be dispensed with; where the worker wants to form any, he will have little difficulty in knowing how to proceed from what has already been said.

It is no doubt well known that the margins of writing-tables, card-tables, etc., are generally finished with veneer. This should be laid before the mouldings are worked, and may be done with hammer or caul. In either case the long pieces, that is those at the back and front of the table, should be laid first, and then the cross-banding or end pieces, which should be within the ends of the others. To prevent shrinkage at the joints, a strip of paper should be glued over these and left till the glue is hard, when it may be removed at any time.

Made-up door frames are done in a similar manner, and I mention this principally to caution beginners against the way in which veneers are sometimes—not so often now as formerly—stuck on the rails, or top and bottom pieces of the frame. The grain of the veneer is occasionally at right angles with that of the solid wood underneath. In other words, it is parallel with that of the door styles, perpendicular instead of horizontal. This, by most authorities, is now considered false construction, and as I think, rightly so. Anyway, without discussing the ethics of veneered door framing, the novice may be told that no one would consider it wrong to lay the veneer with its grain corresponding with that of the pieces on which it is stuck.

It is seldom necessary to lay veneer on end grain of wood, but as it is occasionally so, it will be well to remember that the wood must be thoroughly well sized, I may almost go further and say smeared with glue, in order that the grain may be completely stopped so that it will not absorb more when the veneer is laid.

It is not practicable to mention all the varying circumstances in which veneer may be employed, but enough no doubt has been said to enable the novice to get over any little difficulty he might experience in the general run of work, and if he is in doubt at any time inquiries will no doubt elicit the desired information in the "Shop" columns. Might I, however, as knowing something of the vague character of some of the inquiries frequently put by correspondents, suggest that these should furnish as fully as possible details of the work about which advice is required? Answers frequently require a good deal of thought, and it is impossible that they can be as helpful as the Editor and his staff would wish if inquirers only state half their case. Let them write fully, as by so doing they not only lighten the labour of those who devote their best services to WORK, but they will be helped more than they can possibly be when the questions are so vague that the reply must necessarily be given a good deal in the dark. If the advice and time of capable men are worth anything, they do, at least, deserve to have fair play by knowing exactly what is wanted, either in the way of intended construction or in the avoidance of mistakes in future. I trust that, so far at any rate as veneering is concerned, inquirers will bear these concluding remarks in mind, and it will at all times be a pleasure to the writer "to help a lame dog over the stile."

STENCIL CUTTING.

BY FRED MILLER.

STENCILLING is the readiest way of decorating a surface by means of a perforated plate, and is largely used in house decoration for putting patterns round the frieze, cornice, and upon the ceilings. The design is cut out of some thin material, such as paper or zinc, a pigment is brushed over the plate with short stiff brushes made expressly for this purpose, and the colour passing through the stencil plate on to the surface upon which the stencil is placed, leaves an impression there the shape of that portion of the plate cut away. The simplest kind of stencil we can think of is a circle cut out of a plate, which would leave a round spot upon the wall if we brushed the plate over with colour.

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If we cut a few small segments around this circle, not running into it, but each one kept a little distance from the centre, we get a sort of daisy as the flower in Fig. 2. This is an instance of a perfect stencil, for the method and means employed in producing it yield the most perfect result.

Now, suppose we desired to stencil the letter B, and we cut, or attempted to cut, this letter out of a piece of paper, the portions enclosed in the upper and lower loops of the letter would fall out, and we should have an impression, the contour of which resembled the letter B, but detail would be wholly wanting. If we wish to cut a stencil of the letter B, we must "tie" the two pieces that fell out on to the rest of the plate as in Fig. 1, and we can then stencil the letter B, for by not cutting the two loops into the upright, the centre portions are kept in their place. The skill in designing stencils is seen in the way these "ties" are made to actually form an integral portion of the design, so that the pattern actually depends upon the ties for its proper emphasis and expression. But to fully explain myself, let us refer to the illustrations given with this number of WORK. We have seen that the flower in Fig. 2 is complete in itself. But the leaf-stalk requires more careful consideration before we cut it, for there are other considerations to be attended to than had to be studied in cutting a flower. It would be possible to cut the leaf part of the design out of the plate without reference to "ties," for there is no part of the design that makes a continuous line as in the letter B, and so let a portion of the plate through. But it is important that the stencil should be well held together, for in using it many dozens, possibly hundreds, of times, if the plate were weakened by not having a sufficient number of ties, it would fall to pieces after a little use. There are two ties, A A, in Fig. 2 to strengthen the plate, but such ties form no part of the design; on the contrary, we might say that they rather mar it than otherwise; but in such a pattern as this, when placed, for instance, around the frieze of a room, the ties would not be seen. If it is thought desirable to get rid of these ties, a second plate, having the ties *only* cut out of it, is prepared, and when the colour is dry, the stencilling is gone over a second time to fill in the ties. Care must be exercised in getting the plate with the ties on it over the stencilled pattern accurately, and practically I have found it takes little, if any, longer to put the ties in by hand; and it is much more likely to be done by hand without showing than if they are stencilled in. But in patterns placed some distance from the line of sight there is no necessity to trouble about obliterating the ties.

The leaves that spring from the stem, it will be noticed, are not cut into the stem itself (thereby avoiding weakening the stencil), but are gradually tapered off, so that when seen at a little distance the leaves appear to *melt* into the stem. This stencil (Fig. 2) was designed by Mr. L. F. Day, and was used as a border, and in order to save time two portions were cut out of the plate, so that a double pattern could be stencilled without having to shift the plate. Where a pattern has to be repeated many hundreds of times, a great saving of time is effected by having more than one section of the pattern cut. In order to accurately fit the plate on to the portion just stencilled a "key" is cut in the plate, shown at B B (Fig. 2). This key is stencilled, and when the plate is shifted along the right-hand side the plate is fitted over the key, B B. By this means there are no unequal gaps between one impression and another, as would be the case were the plate shifted along at random. Remember always to cut "keys" in stencils that are continuous.

In Fig. 3 we have a simple design, in which the old Greek key pattern is utilised as a kind of termination to the leaf-stalk. Such a pattern as this would do for a narrow border or on the flat part of a frieze. In this design the ties are made to form part of the design. A good many patterns that have been worn threadbare by long use, until the eye tires of them, can be modified and adapted, and quite a modern feeling

Fig. 1.—Example of Stencilled Letter.

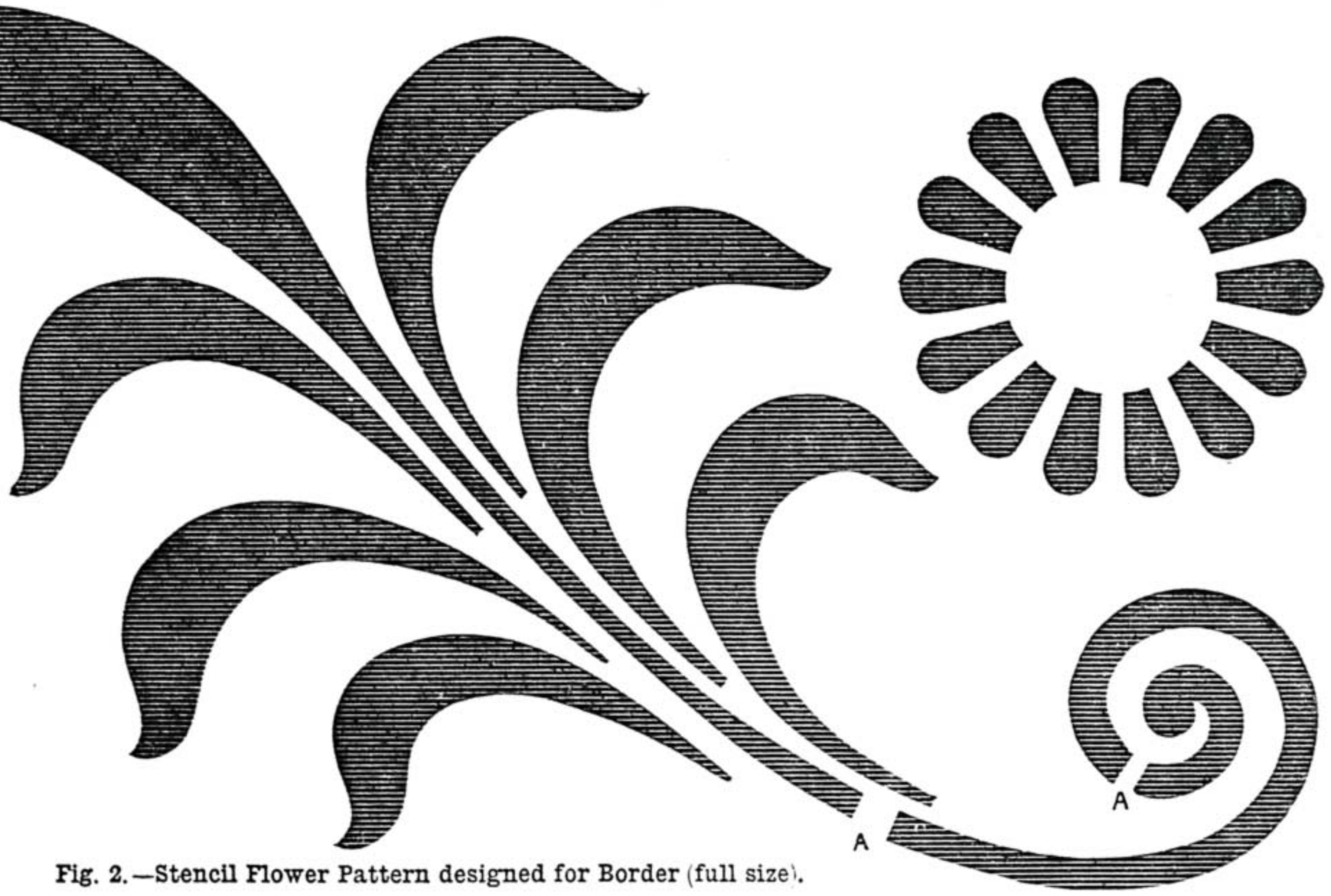

Fig. 2.—Stencil Flower Pattern designed for Border (full size).

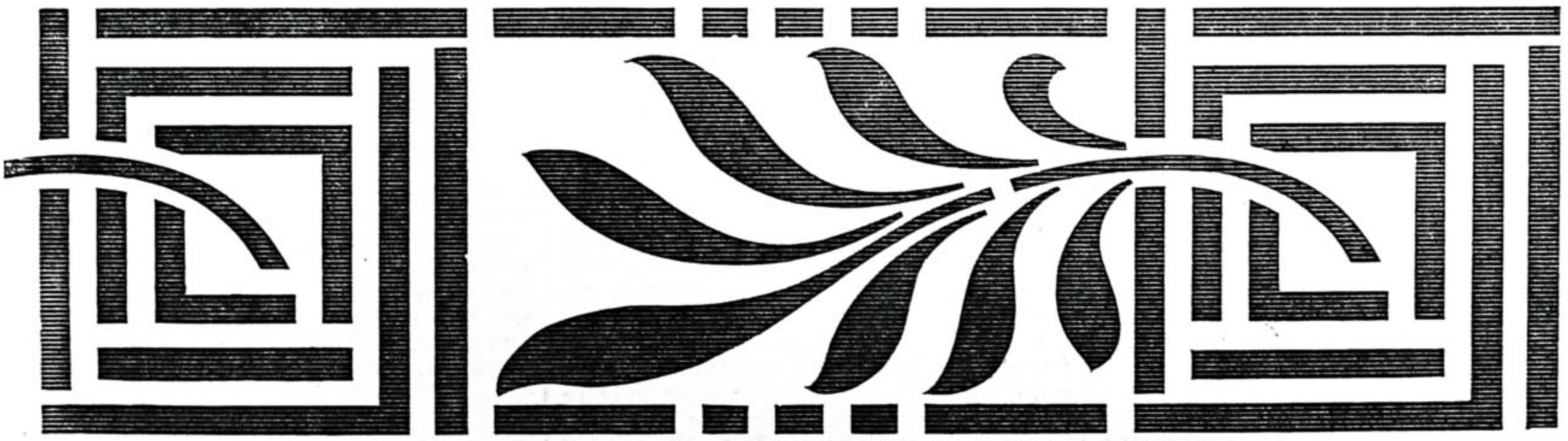

Fig. 3.—Stencil Pattern, showing Combination of Leaf and Old Greek Key Pattern.

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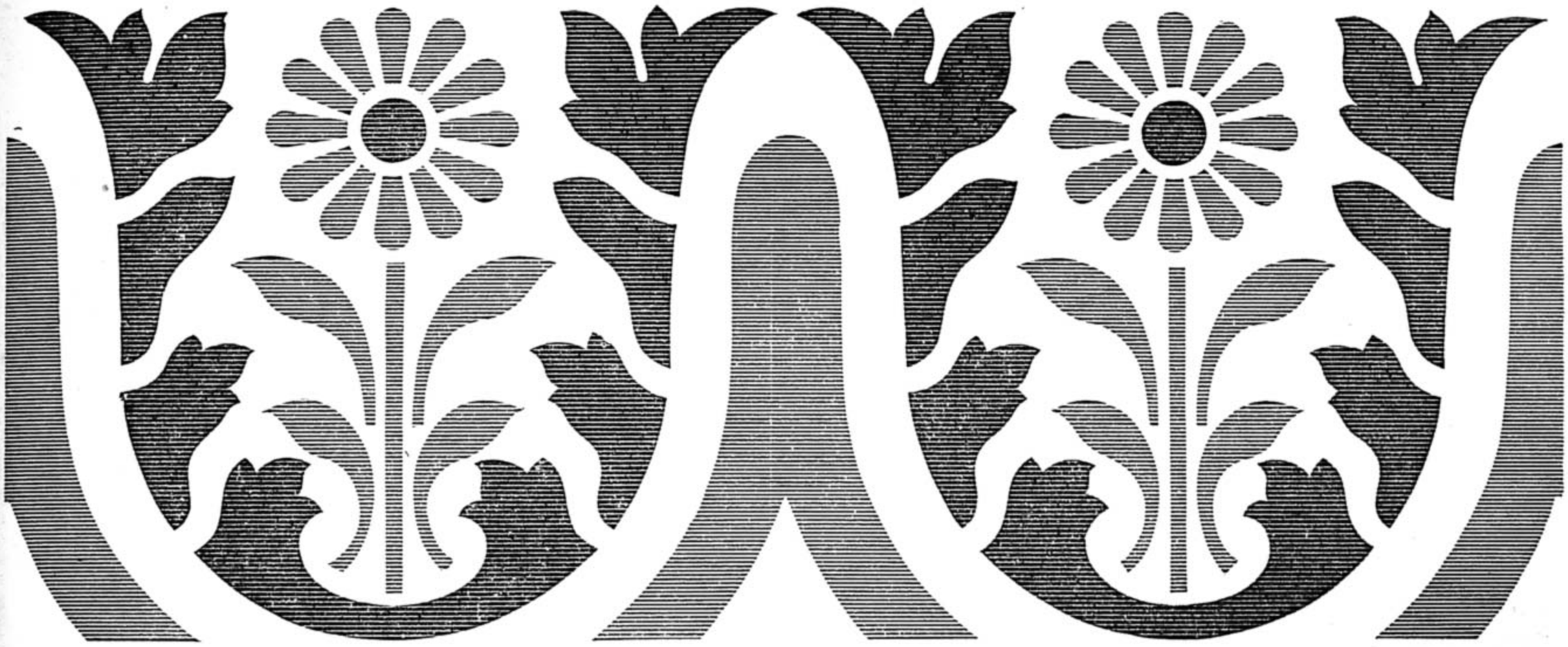
given to them. Too many stencil patterns in use are far too trite and hackneyed to be tolerable, and the decorator, instead of using them at all times and places *ad nauseam*, should endeavour to relieve their monotony by importing his own individuality into them. Fig. 4 is another modification of a well-known pattern. This again would be suitable for an "O. G." moulding or a narrow border below the cornice. In this design it is important to stencil the sprig, B, in a lighter colour than the "Acanthus" pattern A. but we must touch on "Using Stencils" on another occasion. The material out of which stencils are cut by decorators is usually cartridge paper, and when the design is cut a couple of coats of knotting varnish are brushed over it (the second one after the first is dry) to make it tough and enable it to wear well and be cleaned. If care be exercised in using paper stencils they will last very well. Draw out your pattern upon thin paper, and transfer it to the material you are about to cut your design out of. carefully, and avoid allowing your knife to go too far and cut more than you want. At the first go off you will find it difficult to keep a mastery over your knife, and cut the curves with freedom and feeling, but a little practice will soon overcome this amateurishness. There is a regular stencil-cutting knife, fixed in a round handle, that can be bought at any good tool maker's for about 9d., and I would advise those who think of cutting many plates to get one. Cut your stencils on a sheet of glass, as the knife travels



No. 1.—Stencil Plate for Fig. 4.

No. 2.—Stencil Plate for Fig. 4.

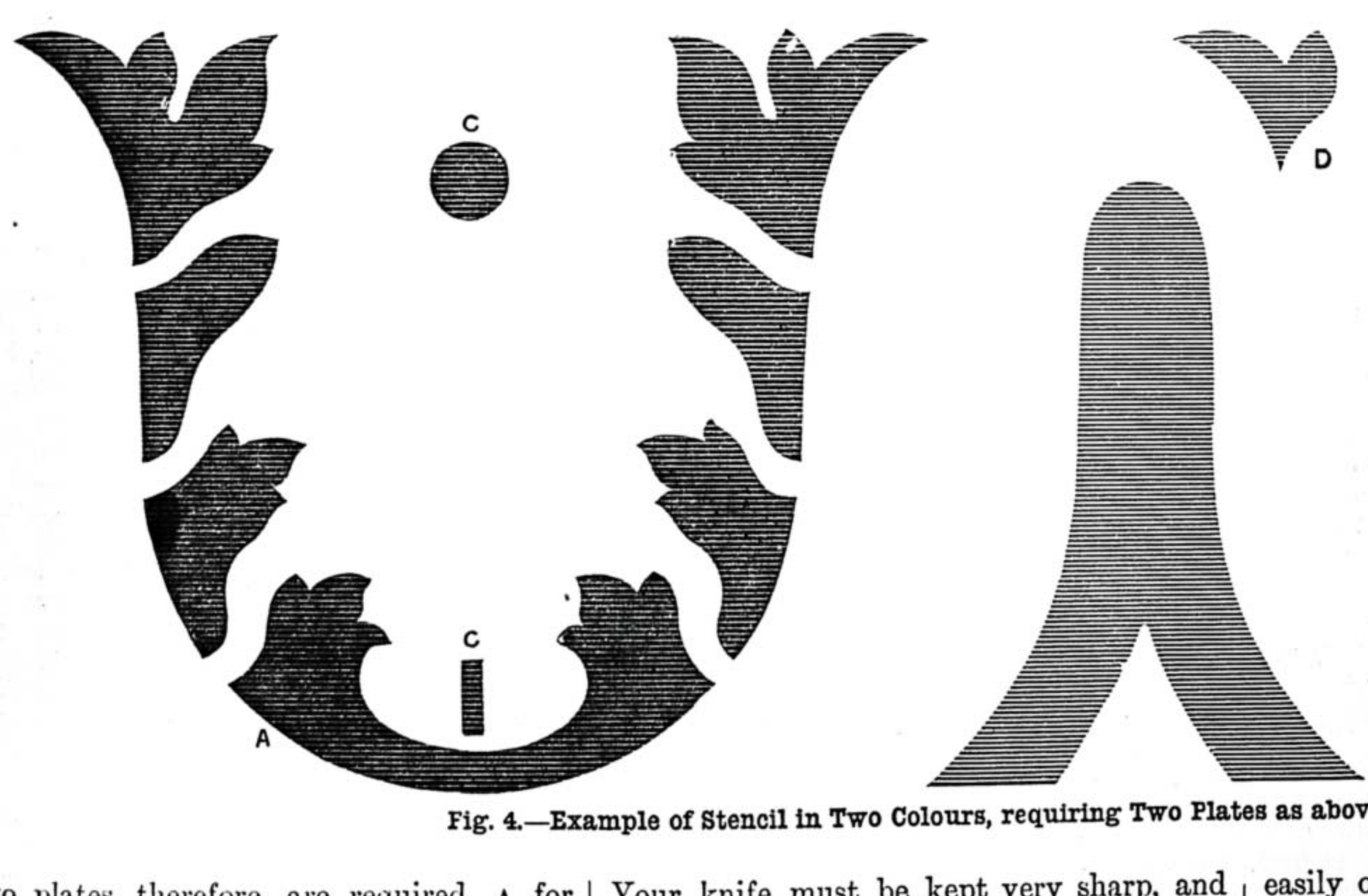


Fig. 4.—Example of Stencil in Two Colours, requiring Two Plates as above.

Two plates, therefore, are required, A for the acanthus, with the keys, C C, to show where the sprig is to be placed; and B to stencil the sprig and "tongue." Three sections at least should be cut of such a pattern to save time in using the stencil. Here again, though the acanthus is cut up into segments to avoid weakening the plate, these ties are not such as mar the design.

It is possible to stencil in two colours without having two plates by using two stencil brushes, and not having them too large, so that the colour of one part of the plate spreads into that of the other part. In Fig. 2 the flower could easily be stencilled in one tint, and the leaves in another colour; Your knife must be kept very sharp, and have a point so that you can go round your curves with ease, cutting through the paper with one stroke. Be very careful not to cut too far; but should you cut through a tie, you must glue a piece of paper over it. In stencils requiring more than one plate, as in Fig. 4, see that the various sections fit accurately together, and to this end it is well to trace the complete design on tracing paper and transfer the various portions by means of the black transfer paper, marking in the "keys" at the same time. Such forms as the flower in Fig. 2 are the most troublesome ones to cut, and you must not hurry the matter, but cut each petal easily over the smooth surface, and enables one to shape the curved lines with ease. Never attempt to cut on any other material.

Lead foil of the thickness of stout drawing paper I have used; it cuts cleanly and easily, and lies very flat to the wall, and where water colour and distemper are the decorating medium, has certain advantages over paper; but it is much more costly, and, if the ties break, very difficult to repair, so that all things considered I advise my readers to keep to paper. Zinc is often used; but the tyro would not cut this metal, and to get it done by a professional stencil cutter would be a costly proceeding, so we will dismiss it at once.

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A stencil looks much fuller on the plate than when it is stencilled, for the thickness of the material has to be taken off all the forms, as the brush, in going over the plate, does not take the colour up to the extreme edge of the design. Therefore keep the design on the side of fulness to counteract this tendency, especially in such forms as stalks and lines, which are apt to look thin and wiry if not cut wide enough.

THE DULCIMER, AND HOW TO BUILD ONE.

BY R. F.

THE Dulcimer, which the Germans call "Hackbrett," the Italians "Cembalo" and "Salterio Tedesca," and the French "Tympanon," is undoubtedly one of the most ancient musical instruments, and the undisputed father of the modern pianoforte.

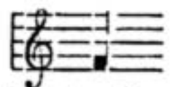
We have no reliable data as to its introduction into Europe, but it was probably brought to us from the East, perhaps by the Crusaders, for it has been known for ages in Arabia and Persia and also in the Caucasus under the name of "Santir." The old English "Dulsate" and "Dulsacordis" were instruments of which we have no correct information unless they were dulcimers, while the dulcimer of Scripture is still more doubtful.

There is a remarkable resemblance between a seventeenth century dulcimer of Italian make now in the South Kensington Museum, and a modern Georgian santir, as pointed out by Mr. Carl Engel in his "Descriptive Catalogue, 1874."

Dr. Rimbault says, "dulcimer is derived from *dulce melos*" (sweet sounds), probably from the ability of the performer to produce the sweet sounds with the softer side of the hammer or beater with which the instrument is played.

Its use on the Continent seems now to be limited to the gipsy bands of Hungary, but in this country, till within quite recent times, and before it was put in the shade by the introduction of the now ubiquitous cheap piano, it was an instrument in great demand, especially in country places, and many fine performers were to be found whose manipulation was something wonderful. Dulcimer bands, too, were not uncommon, especially in the eastern counties, and generally consisted of a quartette of instruments, composed of first, second, bass, and piccolo or octave. The bass was an instrument nearly six feet long, and strung with heavily bound strings like the bass strings of a pianoforte, whilst the octave was a wee little chap only eighteen inches long. These bands were capable of producing music, especially dance music, of a most go-ahead character, and even performed operatic and other selections with a precision and purity of tone that left little to be desired, the sustained notes being produced by a rapid succession of blows somewhat analogous to that employed by kettle-drummers in the "roll." The unpleasant mixture of sounds caused by the vibration of the undamped strings was, to a great extent, overcome by a judicious application of the soft part of the hand to the strings, but as a rule the music mostly played being of a quick and lively character, did not suffer very much from this "loud pedal" effect.

The recent revival of dulcimer playing is doubtless due in a great measure to the fact that it has been found to make a most charming addition to the piano, and when used to assist at a Cinderella or family dance—when it is not considered really necessary to call in the aid of professional musicians—can render invaluable aid. This, combined with its portability and adaptability for use on board a house boat or yacht, at a picnic or outing, and the undoubted ease with which it may be learnt, justifies the assumption that it is an instrument that has not yet, by any means, seen its last days.

In this and papers to follow I propose to set forth the easiest and best way to build a dulcimer that shall be at once reliable and substantial without being unsightly or heavy, and as portability is a desideratum, we will start on an "F" instrument, that is one that has its lowest steel note tuned to the note  on the piano.

Let us begin then by laying in our stock of wood, and here let me say that it is useless trying to make a good instrument out of inferior stuff; as well attempt the task of "making a silk purse, etc." No;

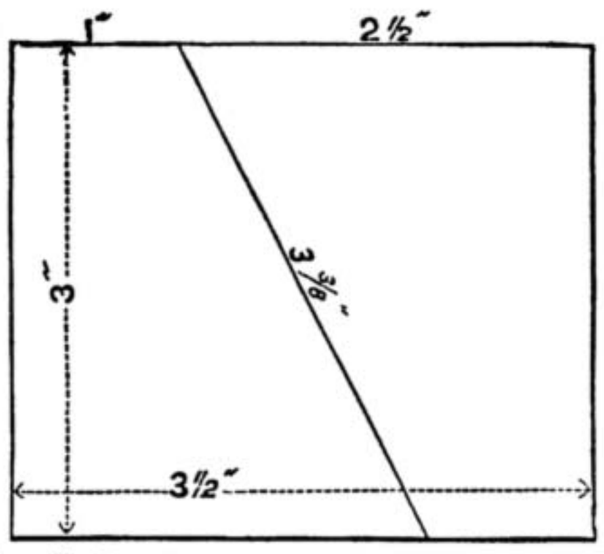


Fig. 1.—Mode of cutting Wood to form "Wrest-pin" and "Hitch-pin" Blocks.

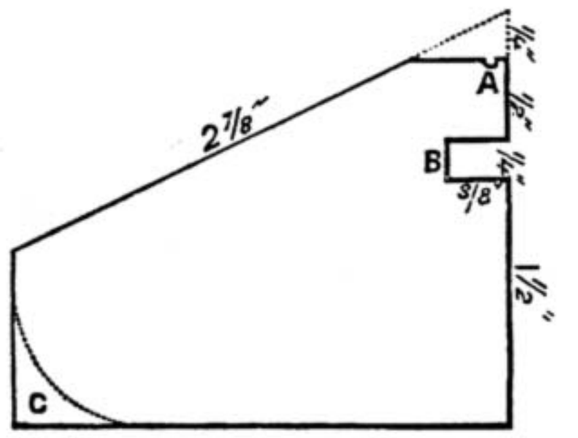


Fig. 2.—Section of Block for "Wrest-pin" or "Hitch-pin" when finished.

thoroughly good, sound, clean, and well-seasoned wood must be used, or the result will be disappointment and vexation. Tea chests and packing cases will not do, however handy they may be.

The wood we require then is one piece of oak or beech, 18 in. long and 2¾ in. by 3½ in. Beech is the best, as it is "kinder" to work and is not so liable to split. This is for the "wrest-pin" and "hitch-pin" blocks. For the back, about 6 ft. of 9 in. by ½ in.; for the "belly" or soundboard—and this is most important—get 2 ft. 6 in. of ⅜ in. by 15 in. wide best yellow or white pine. It is preferable that this should be in one piece, as a joint in the soundboard should be avoided if possible. Besides this we shall require 6 ft. of 11 in. by ¾ in. for the front and back braces, inside bridges, and front and back facings, and about 2 ft. of 1 in. by 1 in. for inside or lining blocks. All these, with the exception of the belly and pin blocks, should be of the best red or white deal, perfectly free from shakes or knots, as anything of the kind would be fatal to good tone. We have now got all the timber required, except a few feet of moulding and veneer for finishing, which will be mentioned later on.

Now to begin. Cut your piece of oak or beech diagonally from end to end, Fig. 1. This will give you two blocks with sloping faces, which, when planed, should measure 3½ in. across; gauge a mark ¼ in. from the top on the square side of the block, and plane down square to this mark—this will reduce the sloping face to 3 in. In the flat thus formed, shoot a half-round groove, A, ⅛ in. deep and ⅛ in. from the edge, and at a distance of ½ in. from the top edge shoot another groove, B, ¼ in. wide and ⅜ in. deep. The block should now present this appearance, and to give it a finish should be rounded off at the corner, C, as shown by the dotted line, Fig. 2.

Of the two grooves that on the top, A, is intended to take a small brass rod called the pressure-bar, and the one in the side is to take the edge of the belly. Having got out our blocks and seen that the grooves are clean and free from "rags," we will proceed with the back.

Cut off 2 ft. 6 in. of the 9 in. stuff, and another piece of 1 ft. 9 in.; clean them up and shoot one edge of each for joining; the shorter one can be reduced to 7 in. in width or it can remain till the joint is dry. Draw a line across the centre of each, and joint up so that the lines come level, and when thoroughly dry, cut and plane it to measure, 2 ft. 5 in. on the lower edge, 1 ft. 2 in. on the upper, and 1 ft. 2 in. from back to front. If half the distance is measured from each side of the centre line, it will ensure the sides being bevelled at the same angle.

So far our work has been preliminary; in the next paper we will commence the actual work of building.

MEANS, MODES, AND METHODS.

FRENCH POLISH FOR WOUNDS.

RESPECTING the application of ordinary French polish to cuts and wounds as advised in No. 26 of WORK, I have been in the habit of so using that article for years, but it ought to be said that the application at first is extremely painful; it "smarts" so much, that in the case of large wounds the effect would, for a time, be agonising. I find the better plan is, after carefully removing the blood as much as possible, to dust or cover the wound with finely powdered resin, which has a peculiar soothing effect, then to bind or wrap up with rag saturated with the polish. And in regard to the latter, I find it preferable to have it thicker than as used for polishing purposes. This may be very easily obtained by filling a small bottle about three parts full with ordinary methylated polish, and then adding powdered shellac or even resin until nearly full. Shake occasionally until the added gums are dissolved; it will then prove a capital article that ought to be available in every workshop. The resin is a good first dressing. Painters, for cuts, use varnish; copal gum dissolved in oil and spirits for coachmakers; resins for house-painting varnish.—W. G.

RUBBING DOWN OILSTONES.

During fifty years' experience amongst joiners in the metropolis and various parts of the country, I never knew more than one or two men who could keep their oilstones in order without an occasional, and in some cases a frequent, rub down. It is impossible

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to keep plane irons and wide chisels, etc., true on a stone, hollow in length or width, and yet how rare to see a workman's oilstone but what is so, the old-fashioned plan of rubbing down on a coarse grit slab with sand and water being a very tedious and troublesome job. Ah me! how well I remember my apprenticeship days (it was in the forties) when the command was given, "Bill, rub my oilstone down." Didn't I grumble at that job and no mistake? Rub, rub, and rub, and sweat and rub for an hour at a time. Little more than twenty years ago, I saw that old-world method practised at a shop in the neighbourhood of Smithfield where I was working, and it was not until I came into Lancashire that I learned how such a once tedious job could be done in a very few minutes by the aid of what is known here as an emery strickle, used by those who look after carding engines in cotton and woollen mills. For the benefit of those who cannot get an old strickle, I will show how to make an emery board that will quickly level the most irregular oilstone.

Material required—glycerine glue, coarse-grained emery, and a pine board, say an inch thick, and any size, 12, 18, or 24 in. long, by 4, 5, or 6 in. wide. Take, say, one gill of hot glue, just such as is used for gluing up work, put it in a separate pot or other vessel where it can be kept hot, and add thereto about a dessert spoonful of ordinary glycerine, stirring well. Now take the board, having first of all planed one surface up true, and also bored a ½-in. or ⅝-in. hole to hang it up by, and lay it face upward upon a large sheet of paper. Cover the surface of the board with the prepared glue, rubbing it in well and evenly with the glue brush. When this is done, without any delay, cover quickly with a thick layer of the coarse emery; bat this down with the flat of your hand all over. Raise the board, shake off the superfluous emery, giving the board a smart rap or two on the bench or table top. Then put aside in a warm, dry place for twelve hours, and repeat the gluing, and covering with emery on the top of the first coat. Rap off all the loose emery, and again put aside to dry. Finally, give the surface a thin coat of boiled oil (with or without the addition of a little black paint), taking care that the interstices between the emery grains are well covered. Let it now rest for two or three days, and when thoroughly dry, it will be found to be a most effective appliance for keeping oilstones nice and level.—W. G.

Cement for Leather Belting.

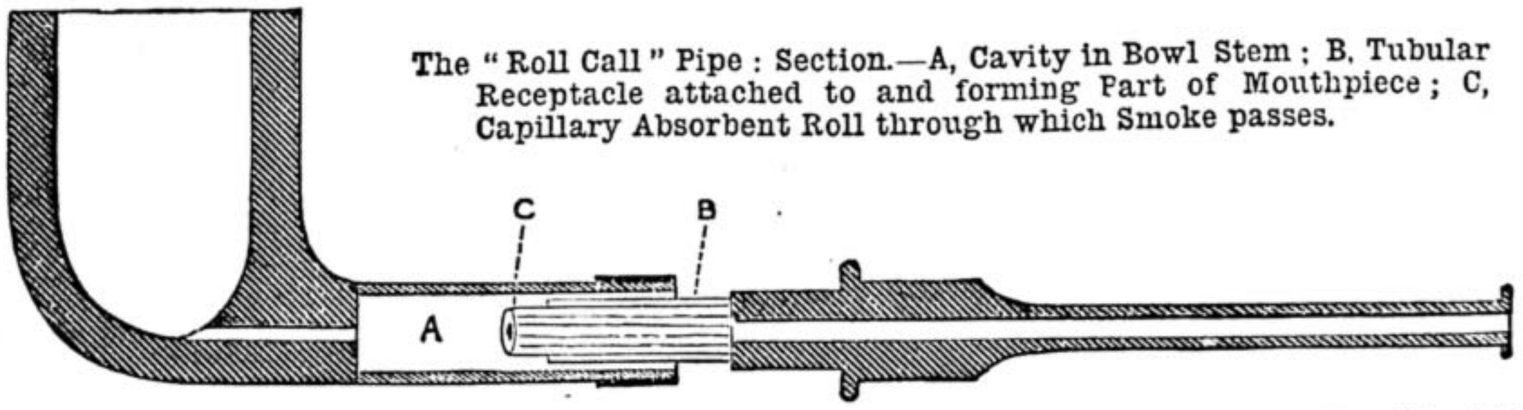
The glycerine glue that is described above makes a capital cement for joining, machine strapping, or leather belting. Power, either of steam or gas, is extending so much in small workshops throughout the country, that many persons, doubtless, will be glad to learn how to piece up broken strapping without having to send a distance and wait for repairs. In my own very modest works, where there is less than a dozen belts running, I find it a very great advantage to be able to repair mishaps to any one of them without any unnecessary delay. Here is my plan. Having first carefully pared down the two ends of the strap to be pieced up, so as to form a lap joint about three inches long, I take a board about three feet in length, and place the two lengths of strap on it so that the joint is midway from end to end on the board. I now temporarily fix the strap to each end of the board by using a hand screw, taking care that the edges of the belt run straight with the edge of the board. Now, first of all, placing a piece of newspaper under the strap at the point of junction, I proceed to glue or cement, as it is termed, the joint with the composition referred to, made quite hot; then driving a couple of ½-in. or ⅝-in. tacks through the joint into the board, I place another piece of board over the joint, and screw all together tight, either with hand screws, small cramp, or by putting in a vice. Preferably, the whole concern remains thus three or four hours or all night, but, if in a hurry, I unloose the pressure in half an hour or so, take out the tacks, and then stitch with white laces or strong waxed hemp. Joints thus made, when properly dry, are practically unbreakable; the addition of glycerine to the glue preventing the latter from drying hard and cracking, as well as rendering it more adhesive. Where it is exposed to the rain, a teaspoonful of turpentine makes the glue waterproof; that much to a pint of glue.

OUR GUIDE TO GOOD THINGS.

96.—The "Roll Call" Pipe.

Mr. Allen Dewsnap, of 65, Pittes Lane, Glossop, has asked me to notice his "Roll Call" pipe, an invention which is intended to render smoking less injurious and more pleasant than it is when pipes of ordinary construction are used. I have no intention of saying a single word in praise or dispraise of smoking. I do not smoke myself for two very good reasons: firstly, because I do not like smoking; and, secondly, because it does not agree with me. But a great many persons seem to enjoy it thoroughly, and if smoking be really harmful through the nicotine that tobacco contains, it will certainly be useful to make known the existence of a pipe which effectually separates this poisonous and irritating matter from the inhaled smoke, while the fragrant aroma of the tobacco is still retained.

The construction and action of the pipe are shown in the illustration below, which exhibits it in section. It is made in two parts, namely, the bowl and stem, and a mouthpiece which screws into the stem. In a tube, B, at the end of the mouthpiece, a roll, C, of an absorbent substance very much like blotting paper is introduced. This done, the mouthpiece is screwed into the stem, the cavity, A, being nearly filled by the roll, which takes up and absorbs all the nicotine as the smoke passes from the bowl into the mouth of the smoker, the result being, to use the words of the inventor, "a sweet smoke and an absence of nausea, a clean pipe, and one that needs neither scraping nor steaming nor brushing."



The "Roll Call" Pipe: Section.—A, Cavity in Bowl Stem; B, Tubular Receptacle attached to and forming Part of Mouthpiece; C, Capillary Absorbent Roll through which Smoke passes.

By people who expectorate much while smoking, and to those who suffer from sore tongues, throat, etc., as a consequence of smoking, this pipe will, doubtless, be found a special boon and a perfect cure, and I should imagine its use would be attended with benefit to any smoker, whether he spits or not. The pipe is made of brier, and is fitted with a vulcanite mouthpiece. It is claimed for it that it can be smoked in any position; that it is economical, as all the tobacco is smoked up, and the last whiff is as pleasant as the first; that it is the least offensive of all pipes to other people, as there are no burnt fumes of nicotine to taint the breath or fill a room; and that the roll prevents steam from entering the mouth, and renders the smoke perfectly cool. The price of the rolls is almost *nil*, as twenty-five, or sufficient for more than 100 smokes, may be had for a penny. The pipe and the application of the material of which the rolls are made are both patented. For the price of the pipe, see the "Sale" column that follows "Shop."

97.—Lodge's Patent Self-Locking Cellar Plate.

This cellar plate, the invention of Mr. John Lodge, 24, Shirland Road, Paddington, W., is an important and useful article, inasmuch as it is an advertising medium, by which articles can be

Fig. 1.—Lodge's Patent Self-Locking Cellar Plate.

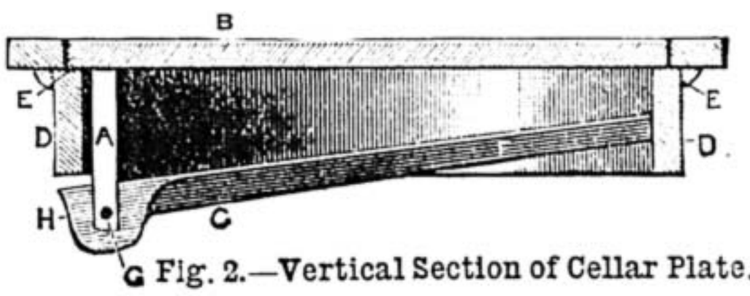


Fig. 2.—Vertical Section of Cellar Plate.

brought under the notice of passers-by, and the names of streets and roads clearly indicated. It seems, however, to be chiefly desirable from the fact that, as the plate is an automatic self-locking plate, pedestrians are in no danger of accidents through stepping on a loose plate not properly put into its place, and the occupants of houses whose cellar approaches are filled with it are insured against entrance in that direction by burglars' boys. The appearance of the plate externally, and the purpose it serves as an advertising medium, is shown in Fig. 1, which speaks for itself; its self-locking principle is shown in Fig. 2. The plate locks itself directly it is placed on the metal ring (D, in Fig. 2) that surrounds the cellar opening, and with the shoulder, E, forms a seating for it. Attached to the under side of the plate, B, is a vertical arm, A, to which a horizontal arm, C, is attached by the pin, G. This arm is just long enough to fall against and grip the side of the ring, D. The end, H, of the arm, C, also butts against the lower surface of the ring, D, and thus affords additional means of preventing it from falling out of the horizontal. The new plate, it is said, has been tested in many places, and has been found to be in every respect simple in action and easily managed, and a safeguard against burglars and accidents to passers-by.

The Editor.

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SHOP:

A Corner for Those who Want to Talk It.

*** Notice to Correspondents.—*In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of* Work *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

To Advertisers, Manufacturers, Etc.

*** The Editor of Work wishes to draw the attention of Advertisers, Manufacturers, Patentees, and Retail Dealers to the following letter from Mr. George H. Bruce, 10, Helena Street, Smethwick, as a proof of the value of Work as a means for bringing new inventions, machinery, tools, appliances, etc., into notice, and as an Advertising medium. Mr. Bruce writes:—

"I beg to acknowledge the safe return of the gauge and electro lent to you for use in Work, and to again thank you for the very excellent notice which you so kindly published. As a proof of the extent to which the paper is read, I may say I have received thanks from over forty different towns between Plymouth and Dundee, also from aboard ship, and from Ireland. I shall do all I can to recommend Work, and should I in the future make anything new to put on the market which would help to make Work still more valuable to my fellow readers, I will submit it to your approval."

I.—Letters from Correspondents.

Saw Hammering.—J. C. (*London, W.*) writes:—"Your correspondent, in his remarks on saw hammering (see page 333), very rightly states that no two saws, when buckled, can be treated exactly alike; that is the great difficulty, and one which renders it quite impossible for the thing to be placed before the amateur in a readable form. I have had many years' practical experience at the business, and I do not know of anything which is so very puzzling to a beginner, even when in command of the proper appliances. A saw may be what is termed fast or loose, each condition requiring exactly opposite treatment, but the novice could never distinguish between the two. Even when a saw is out of buckle, and what is termed firm, there will occur a variety of bends and twists which are quite distinct from buckles, and require a different-shaped hammer to deal with. Buckles are removed by a heavy hammer with one round face called a 'doghead.' Twists or winds are made to disappear by a hammer with two long narrow faces: one in a line with the shaft, and called a long face; the other at right angles to it, and called a cross face; these and an anvil, and a lot of experience, are the only things that will surmount the difficulty."

Finsbury School of Practical Amateur Mechanics.—Mr. Thomas J. Syer, the Principal of this excellent technical school, which is carried on at Mr. Syer's workshops, 45, Wilson Street, Finsbury Square, E.C., and which is within a few minutes' walk of Broad Street, Liverpool Street, and Moorgate Street Railway Stations, the Tramway Terminus in Finsbury, and the Bank, writes to say that the fresh term has already commenced. Classes are held in cabinet work and carpentry, wood carving and engraving, wood turning, plain and ornamental, metal working, mechanical drawing and coloured plan work, French polishing, upholstery, fret cutting, repoussé work, and tin plate working. Prospectuses with fees, etc., may be obtained of Mr. Syer at the workshops.

An Easily-Made Fret Machine.—One in a Fix writes:—"In No. 21, page 332, W. R. S. gives a method of how to rig up a machine of this kind. Acting on this I started to make one, but cannot see how to work the wheel. I hope W. R. S. will be so kind and obliging as to let me know how it is done, and also how it is fixed."—[W. R. S. is requested to comply with the wish of One in a Fix, and make his meaning perfectly clear.—Ed.]

Lock Repairing and Key Fitting.—Erratum.—By a misadventure the names of the springs described in the first paper on this subject in No. 21 of Work, dated August 10th, 1889, became interchanged. The spring shown at G, Fig. 1, is that which is known as the "Scotch Spring," and D is the spring bolt. The "Feather Spring" is the spring illustrated in Fig. 3. This has been pointed out by Mr. Wilson himself, the writer of the article, and several other correspondents, to whom I may say that the passage to which they take exception has been revised by Mr. Wilson. This will be a sufficient reply to Ironmonger's Assistant, L. L. (*Salisbury*), and others, whose letters will need no further reply or comment.—Ed.

Hinged Bevel for Pocket.—J. G. (*Glasgow*) writes:—"I see a description and drawing of a very handy gauge in Work No. 23, page 363, for the vest pocket. If a hinged bevel for the vest pocket were made, it would come in handy for many artisans."—[Why not write to the makers of the pocket gauge to which you refer, and ask if they cannot meet your wishes?—Ed.]

II.—Questions Answered by Editor and Staff.

Paper to Imitate Oak Graining.—H. M. (*Crumlin*).—You can buy this of any one who sells paper hangings.

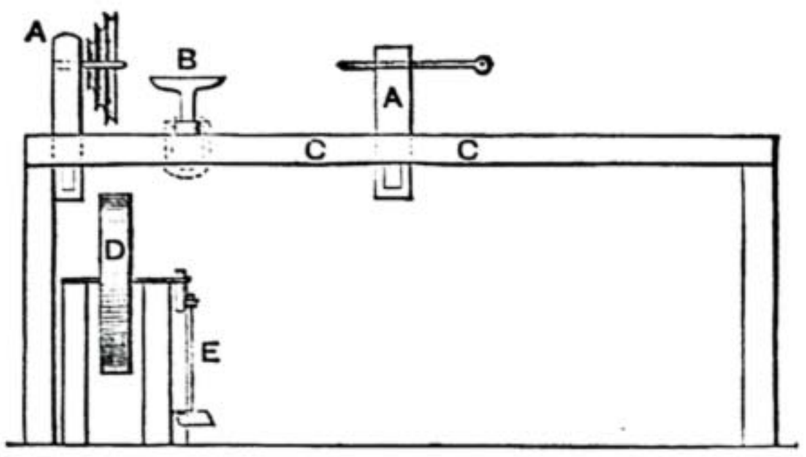
Watch and Clock Repairing.—Amateur and Nero.—Before this can meet your eye you will have seen that the papers on this subject are under continuation.

Studio Camera Stand.—Darkie.—A paper showing how to make this and other camera stands appeared in No. 29 of Work.

Rubber Stamp Making.—Albion.—As soon as a competent writer offers his services this subject shall be taken up.

Artificial Leg.—Zomo.—I cannot undertake to tell you how to make an artificial leg, for I suppose you mean a leg other than that of a mere wooden leg. For anything of this sort the proper person to apply to is Mr. James Gillingham, the celebrated Surgeon Machinist, of Chard, Somersetshire.

Lathes for Everybody.—Ben Nevis (*Appleby*).—I am glad you like my article on "Lathes for Everybody." I am sure, if you make a lathe of some sort, you will be fully repaid for the labour it will take. It would scarcely be consistent with my object to send working drawings of every part of the complete lathe, as it has to be adapted to existing circumstances, and they are not similar in any two cases. I send herewith a rough sketch, which will explain the position of the various parts, and may be of assistance to you. The bench is an ordinary one on trestles; the top consists of two



Lathes for Everybody.

A, A, Head. B, Rest. C, Bench. D, Grindstone. E, Treadle.

3-inch deals two inches apart; the heads fit into the space thus formed and are secured with wedges, as explained in the article. The grindstone is heavy and driven by a crank and treadle. It occupies the position shown when used as a fly wheel, and can be removed or pushed back out of the way when not in use. A leather band conveys the motion to the pulley. I think you can scarcely fail to comprehend matters, but I will give any other directions you may require with pleasure. The Editor has instructed me to write another article on "Lathes for Everybody." This I will take in hand at once, and describe a simple mandrel lathe. I will remember your suggestion of more detail.—Self-Helper.

Alarm Bell Battery.—W. R. (*Bristol*).—The fault you mention is a common one with permanganate of potash in solution. This salt is rapidly decomposed, and a hydrated manganese dioxide is deposited, forming the black mud of which you complain. When used in a single cell, without a porous partition, this mud fouls the zincs, and gives trouble from this cause alone. When about to renew the charge of your cells, use chlorate instead of permanganate of potash, and you will be pleased with the result. Employ half an ounce of chlorate of potash in each cell.—G. E. B.

Galvanic Battery.—Gil Perez (*Wakefield*).—(1) The cell described and illustrated by you is similar in every respect to the Bunsen battery described in No. 1 of Work. You may charge it as there directed for a Bunsen, or with a solution of chromic acid in the porous cell with the carbon, made up as directed in reply to J. R., "Electric Light for Photographic Dark Room." One cell alone, however, will be useless. You must have three such cells, and arrange them in series, to light a very small lamp. (2) If you placed peroxide of manganese in the porous cell together with broken coke, and used a solution of sal-ammoniac in the outer cell, the battery would only be suitable for ringing a small bell, or working a model telegraph instrument, but would be useless for electric lighting. (3) Earth wires are used in electric telegraph systems, but are not to be thought of for your requirements. I would advise you to read closely the three articles on the Bunsen battery in the first three numbers of Work, and also all the replies to correspondents on this subject in "Shop."—G. E. B.

Plumbing.—Shorter.—Water is kept back in plumbing by a stopcock—or by what is technically called a stopback—made of clay or new bread. The same thing is arranged in the large cast-iron mains by simply packing the joint.—G. S.

Panorama Tackle.—Machinist (*Bath*).—Your only chance of obtaining the necessary drawings for making and erecting the machinery used in working a panorama is by advertising for same in *The Era* and *The Stage* newspapers. A stage machinist, used to working these "shows," would then, no doubt, supply you, if well paid. I certainly know how they are worked, but am not competent enough to write upon the subject. Your first letter did not reach me, or it would have been answered.—H. L. B.

Boot and Shoe Making.—Leather.—The introduction of boot and shoe making into Work has been carefully considered, but if this is touched on, why not include tailoring, hat making, and other kindred subjects? I appreciate your letter, and wish I could see my way to satisfy your wishes, but at present, at all events, it is not possible to do so.

American Organ Building.—Genius.—I cannot say with any degree of certainty when these papers will be commenced. I trust you will not have to wait long.

Kaleidoscope.—Tom Smith.—Indian ink will serve for the back of reflectors, if a thick solution is prepared and smoothly applied with a camel-hair brush. The ground glass circle is to be fixed flush with the inner face of the lid of the object box, in which a recess must be turned or otherwise formed to receive it. The glass is *not half round*, but a *complete* circle, as the dotted line, A B, Fig. 6, refers to the section of box, Fig. 5.—T. R.

Index to Weekly Numbers of Work.—Elphye Janan.—Your suggestion shall be considered, with the view to its adoption at some future time, if found practicable.

Bicycles Uphill.—A Novice (*Southampton*).—I am at a loss to know what your correspondent's difficulty is, as there is nothing indicative in the letter. It simply describes a tricycle of a type now considered out of date, or, rather, out of fashion, the now popular machine being the "Cripper steerer," *à la* handle bar, like the "Safety" bicycle. I may say, however, that a first-class tricycle of the type he mentions will climb hills equal to anything yet on the road, even including the "Safety" bicycle. The side handles give a better purchase for pulling, with the arms in a direct line from the shoulder, than ever can be had with the cross bar in front. When a bicycle comes to a dead stop on a hill, that means a dismount. With a tricycle you may stop and allow your pedals to revolve, say, a quarter of a turn backwards, in order to bring one up for a fresh stroke, when you may again proceed. The principal thing wanted for hill climbing is a good machine, and considerable practice at the work, and a rider who makes a speciality of hill climbing is always immeasurably better at it than one who contents himself with the level and walks the hills. 40-in. wheels, geared level, are not too large for a tricycle, as smaller wheels geared up would be no easier to drive, unless you had gearing to gear them down for hill climbing. I shall be happy to assist A Novice in any way I can through the columns of Work.—A. S. P.

Photography, etc.—F. D. (*Luton*).—I am glad to find that the papers on photography and plating solutions which have appeared in Work are satisfactory to you. Work, you must bear in mind, is a magazine of construction and decoration, and that, although the manufacture of photographic appliances will be fully treated, it is not possible to deal seriatim with every branch of the art. When the papers on jeweller's work are commenced, a design for a jeweller's work bench will be given.

Photography, etc.—Palette.—Before this reaches your eye, you will have read, and perhaps begun to act on, the instructions given for making a camera. The Instantograph must form the subject of a separate paper. Any question you may wish to ask on the fitting up of lenses will be answered in "Shop." The camera-obscura and its construction must also form the subject of a separate paper.

Gear Cutting.—Pendule.—Your letter, requesting a paper on this subject, has been sent to a contributor, who will comply with it if possible.

Pen for Ruling Dotted Lines.—H. C. S. (*London, S.E.*).—Your ruling pen seems to be an ingenious contrivance for the purpose in view. I will endeavour to help you in the direction indicated by you. It is a pity that it is not provisionally patented, for the cost of doing so would be only £1.

Printing Frames.—G. P. (*Camberwell*).—An article on this subject will be given as soon as practicable, and special reference will be made to contrivances for printing large cyanotypes. Meanwhile, as you say you do not know what a printing frame is, it may be of assistance to you to know that they are used by all photographers. No doubt any photographer would show you one, and you will then have a very fair idea of what is wanted.—L. J. P.

Hour Glass.—W. E. D. (*King's Lynn*).—I am afraid the subject is hardly a suitable one for an article to be devoted to, and what you ask it is impossible to give in "Shop." I think the best thing you can do is to get a catalogue of carving and fretwork designs from Henry Zilles & Co., whose address you will see in their advertisement. You will, no doubt, be able to pick details from some of the full-sized patterns, which you can combine, to make a stand such as you require. An article on a kitchen dresser is in hand, and will appear in due course.—D. A.

Mediæval Furniture.—T. A. E. (*Newcastle-on-Tyne*).—The subject is referred to in many works, and you can only gain a good knowledge of it from an extensive course of reading. I am not prepared

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to recommend any one book specially. Your best plan will be to write to Mr. Batsford, bookseller, Holborn, who has a large number of publications on furniture, for his list. You see so much depends on the particular branch you wish to study, that to recommend one book might mislead you. I am sorry to say that your second question, viz., "What period does the style of having straight lines?" is not sufficiently definite to enable me to answer it. If you will supply the words which have evidently been omitted, I may be able to help you.—D. A.

Gold Paper and Mounts.—ANXIOUS ONE (*Newcastle-on-Tyne*).—It is only by experience that mounts can be properly cut, and the tools are what are known as mount cutter's knife and handle, dividing compasses, iron straightedge, pencil, etc. Gold paper, ready prepared for use, can be bought at City Frame Company, 29, Basinghall Street, E.C. Sixpence per half sheet best gold paper, and postage extra.—G. R.

Cassell's "New Popular Educator."—INCE (*Wigan*).—Cassell's "New Popular Educator" will be complete in forty-eight monthly parts, at 6d. each, or in eight volumes, bound in cloth, 5s. each.

Models for Pasted Papier-Mâché.—W. H. S. (*Southampton*).—Any pattern-maker, joiner, or cabinet-maker would be able to make the moulds for papier-mâché. When many copies are wanted of the same article, it is usual (in the trade) to have a number of casts of the mould made in iron; these are less liable to damage, and, by means of them, the pasting of several copies of the work can be proceeded with at the same time. Tea trays, for instance, being articles wanted by dozens, are pasted on iron moulds.—S. W.

Sign-Writing Book.—Messrs. Brodie & Middleton, artists' colourmen, Long Acre, London, W.C., publish a book on this subject.—H. L. B.

Making Ink.—A SUBSCRIBER (*Henley*).—For *black ink*, the following has been recommended:—Bruise 6 oz. of best Aleppo galls, and boil in six pints of water for several hours, adding more water to supply the loss by evaporation. Strain whilst hot through calico into a clean vessel. Add 4 oz. gum arabic, and boil again till the gum is dissolved. Strain again whilst hot into a stone bottle, and add 4 oz. sulphate of iron, previously dissolved in water. Lastly, to preserve from going mouldy, add three drops of creosote for each pint of ink. To appear *thoroughly* black keep for some time before using. A *blue black ink*, but one which appears violet at the time of writing, is made by bruising elderberries, and setting them in a warm place for three days to ferment; straining and adding to each six pints of juice, ½ oz. sulphate of iron, and ½ oz. of acetic acid. A *red ink*, which, it is said, will not lose its brilliancy by use with steel pens, is made as follows: Grind one part carmine with fifteen parts acetate ammonia and fifteen parts water. These are allowed to stand for some time, strained, and then thickened with a few drops of dissolved white sugar. For *blue ink*, the following is said to be good:—To 1,000 parts of boiled water add thirty parts of Prussian blue dissolved in four parts of oxalic acid.—S. W.

Two Speed Geared Cycle.—J. H. B. (*Narbeth*).—In theory, your idea of two gears is desirable, but you are, no doubt, aware that several contrivances for hill climbing power, that is, lower gearing, have been devised and used. They have not, however, been generally adopted, though more than one fully answer the purpose intended. I have used a tricycle with a low gearing in addition to the normal, but, while admitting its occasional advantages for hill climbing, I prefer a light machine without complications. Your specification has, however, been very carefully considered. The plan is, undoubtedly, ingenious, but is open to several objections, though possibly it may contain the germ of something which, if worked by practical cycle manufacturers, might eventuate in success. As it stands at present, I fail to see any advantages over the ordinary run of machines, and I must say that I do not approve of your plan for freeing one wheel when turning corners. I think you will gather from the foregoing that, in my opinion, it would be, to say the least, doubtful whether you would be able to recoup yourself for any expense you might go to. I think your best plan would be to see if you can induce any manufacturer to take up your ideas, but, of course, before doing this, it would be advisable for you to obtain provisional protection. In reply to your second question, I may say that I do not think it at all likely that you would get a patent agent of any standing to give you the guarantee you suggest. He would use every reasonable precaution, and make searches for you, but, of course, he could not take the risk. Unless you are accustomed to patents and specifications, you will find it best to employ an agent, though if you prefer doing without one you are quite at liberty to do so.—D. A.

Ink.—MCINTOSH (*Highbury*).—Blue black, or purple black inks, become jet black on exposure to light and air, because of the action of the light and air on the iron held in solution with the tannic or gallic acid. If you wish to hasten the blackening process, apply the solution of iron to your paper whilst hot, or heat the sulphate of iron a little before dissolving it. Inks made in this way are not so permanent as those which blacken slowly after being exposed to light and air. You could not possibly separate the ingredients by precipitation, apply them separately, and ensure their combination on paper in the form of jet black ink. Try a strong decoction of nut galls in water thickened with a little gum arabic, as a first solution. As a second, use a solution of sulphate of iron in water thickened with gum arabic and applied hot. If I knew exactly what you aim at doing I might help you further.—G. E. B.

Bookbinders' Tools and Materials.—D. T. D. (*Cardiff*).—You will be able to get binders' cloth, leather, etc., at any respectable bindery in small quantities to suit your purposes. Second-hand binders' tools will not be so easily obtained. Bookbinders' tools are the property of the master, and seldom find their way to the second-hand dealer through the pawnshops, like mechanics' tools. I have seen them, however, for sale in Edinburgh. If you write to Messrs. George Royle & Sons, 5, Lovell's Court, Paternoster Row, London, E.C., they may have some cheap lots to suit you. If you write to the Secretary, Science and Art Department, South Kensington, London, you will get the syllabus for next May examination.—G. C.

Violin Tool.—C. O. N. (*Farrow*).—A purfling tool, like the one I use, is sold for 5s. 6d. by J. Scheerer, Covered Market, Leeds. Another kind is sold by Withers & Co., St. Martin's Lane, London, for 4s. 6d.—B.

Parts of Bicycle.—T. C. (*Chepstow*).—The following makers and dealers will supply all parts and fittings for safeties, and other cycles, either in rough, part finished, or completely finished ready for fitting together:—Brown Bros., 7, Great Eastern Street, London, E.C.; Wilkins & Co., 66, Holborn Viaduct, London, E.C.; Thos. Smith & Son, Ladley Mills, Birmingham; W. A. Lloyd, Waeman Street, Birmingham; Wm. Bown, 308, Sumner Lane, Birmingham. The last is about the best place for all kinds of ball bearings, pedals, and everything connected with the trade.—A. S. P.

Polishing Mahogany.—P. J. S. (*Lambeth*).—The best way to finish mahogany is by French polishing it, if you want a bright glossy surface. The process embraces staining if necessary, to darken the colour, oiling, filling or stopping the grain of the wood, bodying in with polish, and finally spiriting off to get a fine smooth surface without marks. For stain use a solution of either bichromate or permanganate of potash, the strength depending on the colour required. Rub down with fine glass paper after staining to remove roughness caused by the moisture. Oil with raw linseed oil, rubbing it well in with a piece of rag, but not saturating the wood with it. Allow the work to stand by till the oil has become fairly dry, and as long as you like afterwards before beginning to fill in. The best filling you can use is one composed of whitening and turpentine with a little rose pink to colour. Mix these into a stiffish paste, and then rub some of it well into the wood. When you judge this has been sufficiently done to stop up the grain, wipe the surplus away before it gets hard with a clean cloth. The wood is then ready for bodying in at any time, though it is always advisable not to hurry on too fast with any polishing process. To body in use a pad formed of cotton wadding enclosed in a piece of soft rag. Moisten the wadding with French polish and cover it with one fold of the rag. Give this just the least touch of linseed oil, and go over the wood till you have a good body of polish on it. As the rubber dries add more polish, and be careful to cover the wood evenly, rubbing the polish till the spirit evaporates. If necessary, bodying in may be repeated several times at intervals of a day or two. At this stage the surface is smeared and dull-looking, and the final polish is got by spiriting off. This is much the same as bodying in, only spirit (methylated) alone is used instead of polish. Unless you are careful, instead of getting a highly finished surface, you will be apt to remove the previously laid body. Spiriting off is the most difficult part of the process, and requires considerable skill to manage it properly. A series of articles on polishing will appear ere long, meanwhile the foregoing brief directions will, no doubt, be of assistance to you. If, as I conjecture from your second query, you want to polish fretwork, let me advise you to do so before fretting, or if not omit the filling. In the former case you will simply have to touch up the polished surface after the work is completed. If you want very small quantities of thin mahogany, you cannot do better than get it from some local cabinet maker, who will cut a board to any size required, but of course you will have to pay more than if you go to a timber merchant, who, however, will not cut, unless as a matter of favour. The quantity you must take is, however, not excessive, and you will get a great deal more for the same money than you possibly could otherwise by going direct to a timber yard and buying a whole plank. I can recommend D. Witt & Palmer, Drummond Street, Euston Square; Samuel Westlake & Sons, 51, Tabernacle Street, E.C.; or you might try Wm. Bloore, 57, South Lambeth Road; or, W. C. Ware, Lower Kennington Lane, as being nearer to you. I cannot, however, say whether these latter two would supply you. As a guide to you I may say that ⅜-in. plain mahogany may be got from 3d. to 4d. per foot, though of course for fine qualities you must pay considerably more.—D. A.

Engine for Launch.—C. C. (*Hackney*).—Write to Mr. Dugald Clerk, A.M.I.C.E., 13, Temple Street, Birmingham.—J.

Advertisements in WORK.—SPES (*Wolverhampton*).—I can only refer you to the reply given to AD FINEM on page 253 of WORK.

Violin Varnish.—G. M. L. (*Ashington*).—Amber is only soluble after it has been fused, and is then no good for violin varnish. As varnish making requires both special knowledge and appliances, I should advise you to apply to Mander Brothers, Wolverhampton, who used to make an oil varnish which sets hard and bright in from twenty-four to thirty hours; I think it was made by them on the suggestion of the late Charles Reade.—B.

Tempering Mill-bills.—T. C. (*Chepstow*).—(1) Take two gallons of rain water, 1 oz. corrosive sublimate, 1 oz. sal-ammoniac, 1 oz. saltpetre, one pint and a half of rock salt. The pick should be heated to a cherry-red, and cooled in the above bath. (2) Prepare a bath of lead heated to the boiling point. In it place the end of the bill to a depth of 1½ in., until heated to the temperature of the lead, and then plunge into clear cold water.—J.

Bicycle Wheel.—F. K. (*Lee*).—At that place where the rim comes nearest to touching the fork side, slacken back a few spokes with the spoke grip; then on the opposite side tighten up as many spokes as will pull the part straight. It is, however, quite likely that the spokes at this latter part have got stripped at the screwed ends, or pulled through the rim at the head, in which case all such spokes must be replaced by new ones. F. K.'s best course is to give the machine to a repairer. If he finds, however, that the spokes are all holding good, then he may readily put the wheel right by the means above indicated. To bring it to run dead true, set it revolving, and let the rim touch a piece of chalk. Where the chalk touches, loosen slightly a spoke or two, and tighten one or more on the opposite side.—A. S. P.

Tooth Plane and Paper-Rack.—P. E. (*Ebbw Vale*).—All inquiries are answered as soon as possible, but you must not be surprised at not getting a reply at once. To insert replies immediately is impracticable for more reasons than one, although, if it could be done, it would, no doubt, be a convenience occasionally. A tooth, or toothing, plane is similar in appearance to an ordinary smoothing plane, except that the iron is perpendicular. The face of the iron is ribbed, or rather serrated, for some distance from the lower end. This, on being ground and sharpened in the usual way, gives a sharp saw-like or toothed edge, which is used to roughen the surfaces of wood before they are glued together. You will thus see that though the action is a scratching one, the toothing plane is not the same as the "scratch." One of these, with a special iron, might, of course, be made to answer fairly for occasional use. I do not understand quite what kind of paper-rack you want described. Is it one for keeping stock wall papers in, or for showing them, or what? The thing you ask for may take so many different forms that I must ask you to state more fully what it is intended for, otherwise much space might be occupied in describing several arrangements, none of them suitable. Give particulars as fully as you can, and state space available, quantity of paper kept, and so on. Your other inquiry is altogether too vague for me to answer in a satisfactory manner.—D. A.

Zinc Letters.—T. E. (*Padiham*).—You can purchase the letters and figures that you inquire about at any engravers in copper or zinc, or you could have them cut at any good ironmonger's where they keep workmen on. But why not do it yourself? It is not very difficult work, nor does it require a lot of tools. If you cannot mark out the letters, etc., do as I used to do when a young hand. Get the letters out of auctioneers' bills, etc., the size wanted, paste them on the metal you wish to cut them out of, and chop them out with a small chisel on a flat plate of cast iron, and trim up with a file. Any further information given with pleasure.—R. A.

Parts of Overmantel.—F. M. (*South Hornsey*).—The long turned pieces are spoken of as columns or pillars, the short ones as spindles, and the short ends as knobs. The corner pieces are generally called brackets, but you must understand this word is not exclusively applied to such parts, but is a term of very wide acceptance in cabinet-making districts you refer to. To help you, I name the parts asked about, but as you state the reason for wanting to know them is that the Curtain Road turners would charge you considerably more than the usual price if they thought you a novice, I may as well say that considerably more than a knowledge of the common trade names will be required on your part. Any of the Road people in the furniture line would recognise with "half an eye" that you are not in the trade, unless you have a knowledge of it. Of course, you must expect to pay more for a small quantity, such as you want, than usual (trade) prices. It is absurd to suppose that you could get them at wholesale figures, though, no doubt, several dealers will tell you they only sell wholesale, and have only one price. Take my advice, and order through a local tradesman.—D. A.

Vulcanite.—E. R. (*Birmingham*).—Vulcanite may be polished when necessary by simply rubbing it with oil and some smooth powder, such as putty powder. The surface will be dull, but uniform, and the easiest way to put a bright gloss will be to go over it with a little French polish or glaze. This I can recommend you as a quick way, though, of course, the work will not stand much rough usage. However, when it becomes dull, you can go over it again with the polish rubber.—D. A.

Pedometer.—W. C. (*Upper Holloway*).—The instrument W. C. requires is a pedometer. It is, I fear, beyond the ability of an amateur to make. It consists of a train of wheels actuated by a mainspring similar to a watch. A lever escapement is so balanced that with each inclination of the body

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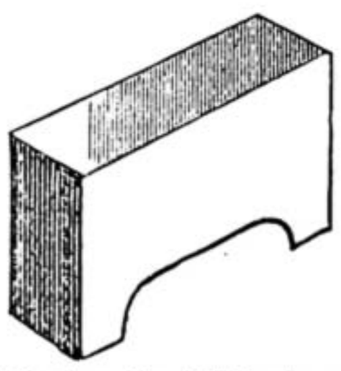
in taking a step the escape wheel is liberated, and the motion is communicated by the train of wheels to the hands on the dial. It thus records the number of steps in a measured mile, and when that has been ascertained it is easy to calculate any distance travelled. W. C. will see from these hints that it requires the skill and knowledge of a watchmaker to construct such an instrument as he requires.—O. B.

Book on Sheet Metal Work.—J. A. (*Grimsby*).—There is a book entitled "The Sheet Metal Worker's Guide," price 1s. 6d., published by Messrs. Crosby Lockwood & Co., E.C. I do not think Warne's publish such a book. If you can get the first volume of Holtzapffel's "Turning and Mechanical Manipulation" you will find a good deal of practical information relative to the working of sheet metals.—J.

Bookbinding.—AN APPRENTICE (*London, S.E.*).—It is intended to carry on bookbinding. A series of practical papers are in the printer's hands, and will appear as early as convenient. Finishing, both plain and extra, will be treated, as the series would be incomplete without it. In the meantime I will be most happy to give AN APPRENTICE any information on gold finishing he may desire, if he states definitely what he wants.—G. C.

Heating Soldering Iron.—E. L. H. (*Begbroke*).—Answering the latter part of your query first, a blowpipe is quite unsuitable for repairing such things as tin cans, kitchen utensils, etc., for this reason: You have, no doubt, seen a tinman soldering with an iron, say, round the spout of a kettle, and noticed that it was done with a kind of rubbing movement. Well, this rubbing seems to do just what the blowpipe cannot do—that is, it brings the metals into more intimate contact, and causes them to adhere; also you cannot guide the metal with the blowpipe so well as with the copper bit, but such jobs as soldering a pin hole, or anything like that, you might manage with a blowpipe, but you will find that you cannot dispense with the soldering iron altogether. With regard to the other part of your query, viz., for a method of heating the iron without lighting a fire or using gas, I am glad to be able to help you. Get a Rippingille's paraffin stove, with not *less* than a 4-in. burner, and a sliding tank. Make, or have made, a sheet iron chimney, like sketch, 3 in. high, to fit over the dome of the burner; rivet four legs on it, or make some arrangement so that it will not topple over. A medium-sized iron will get hot in about five minutes, and the stove is handy for many other things.—R. A.



Heater for Soldering Iron.

Removing Ink Marks from Parchment or Paper.—LANCASHIRE LAD (*Bolton*).—If, as would appear from his letter, our correspondent's error on his plan has been made in *ordinary writing ink*, the stain may be removed by the application of spirits of salts (hydrochloric acid) diluted with five or six times its bulk of water. Solutions of either oxalic, citric, or tartaric acids are said to produce the same results; but in any case the acid must be washed off with clean water a minute or two after application. L. L. is advised to experiment on odd pieces of parchment or paper before touching his plan with acid, as some little neatness is required.—S. W.

Oxygen Gas: "Brin" Process.—C. J. W. (*Beccles*).—Perhaps C. J. W. is not aware that the "Brin" process is protected by patents, and involves special and expensive plant. If desired, I certainly could describe it, but it would take up valuable space, which, I fear, the Editor might object to, as certainly not one in ten thousand of the readers of WORK would be able to carry out the plan. I will, however, direct C. J. W.'s attention to an illustrated article in the *English Mechanic* for July 12, 1889, describing the process. If the information there is not sufficient, I shall be glad to supply any at my command.—O. B.

Electrotyping.—A. W. (*Paisley*).—In answer to your queries *re* moulding, we would suggest that you do away with the frying-pan arrangement at once, and in order to get a practical matrix to cast from (in your small way) make your flong as follows:—Three sheets tissue, one sheet blot, one sheet of brown. After you have beaten in the flong, pack in the whites, and dry off on a copying press heated by gas under bottom platten, bringing the top down hard. After it is dry, cut round and dust with French chalk before putting into casting box.—W. T. R.

Boat Building.—F. G. H.—I have been promised a paper on Canoe-building, but promises, I find, often meet with very tardy fulfilment. I will endeavour to induce some capable writer to take up the subject, but it covers a wide field, and you do not say what kind of boat you wish to try your hand on. Night alarum clocks will also be handled in due course, but it is useless for me, knowing what I have on hand, to make any specific promises. It is satisfactory to know that you and your friends find WORK useful, and that you can say:—"I tried your rational bookcase in No. 15 by Mark Mallett, and have to thank him for his design. I tried it, and made it as good almost, I think, as he could make it himself."

Chairmaking.—CONTENT.—I have an excellent paper, with illustrations, on the method of making a large armchair, usually called an easy chair, by Mr. Adamson, which will soon see the light. I am glad that you also, like F. G. H. and his friends, like WORK, and look forward with pleasure to the appearance of each weekly number.

Polishing Hard Stone.—A. A. M. (*Stockwell*).—Face the stone by working it down to a fairly level surface with the chisel and mallet. If the piece is not sufficiently heavy to remain unmoved under the chisel, fix it to a larger stone with plaster of Paris. Then rub it down with a flat stone, coarse grit, and water. As grit, nothing is better than Yorkshire paving stone smashed up with a hammer. Next rub down with coarsish sand and water, afterwards with fine sand. Finally, polish with putty-powder and a rag. Putty powder—sold under that name at the colourman's—is, we believe, a preparation of calcined tin.—M. M.

Model Locomotive.—W. H. W. (*Seedley*).—One of our contributors, J. H., is describing the construction of such a model locomotive as you require in the pages of the *English Mechanic*.—J.

Grinding Machine.—AMATEUR.—Emery wheels run wet or dry are used for grinding. Write for catalogues to Luke & Spencer, Ardwick, Manchester; L. Sterne & Co., Glasgow; Selig Sonnenthal, Queen Victoria Street, London.—J.

III.—QUESTIONS SUBMITTED TO CORRESPONDENTS.

Sketch for Stall.—J. T. (*Middlesborough*) writes:—"Would a kind reader give me a sketch for a stall for to stand in a covered-in market, to show fancy goods, glass, china, and fancy toys, with a racked back, and to lock up at nights, so as not to have to remove the goods, and as little cost as possible?"

Machine for Making Cigarettes.—S. B. R. (*Blackheath*) writes:—"Being a smoker and lover of cigarettes, I should like to have instructions for constructing a machine for making cigarettes. I mean it to be worked like a sewing machine by a treadle, so that you would only have to put in the paper and tobacco, and out rolls a well-made cigarette when the machine is set in motion."

Parchment Mounting and Stains.—MITRE (*Hanwell*) writes:—"Will a reader kindly inform me, through 'Shop,' how I must treat some parchment certificates which I wish to frame and mount? Should they be damped and pasted to a card in the same way as a paper, or do they require any special treatment? I should also be glad to know how to remove some stains."

Pill Making.—J. C. (*Carlisle*) writes:—"May I ask, through the medium of your valuable paper, WORK, if any of your numerous readers can tell me of any firm who deals in, or makes, tools or machines for pill making? or if any one can suggest any simple tool or machine for that purpose, I shall feel very grateful."

Machinery for Breaking up Old Rope.—R. L. R. (*Liverpool*) wishes to know where he can purchase machinery for breaking up old rope and converting it into oakum. He also wishes to know name of makers of the "American Rope and Oakum Picker," which answers the purpose indicated.

Cleaning Engravings.—IVOR (*Bradford*) writes:—"Having some large engravings to clean, I made a wooden tray or 'bath' 40 in. by 40 in. and 3 in. deep. This I lined with thin sheet lead to make watertight. Chloride of lime in solution is used for bleaching or cleaning. I procured the purest lime sold. Yet I find, after a few hours' standing, that the surface of the lead is covered with reddish-brown blotches like rust. If the engraving touches these it is marked like the iron mould stain on linen. Can you inform me how to make the lead impervious to the lime permanently? Would paint or Aspinall's enamel prevent the rust from coming through, or would the paint itself withstand the action of the lime?"

Ink for Posters.—A. J. (*Ilkeston*) writes:—"I should be greatly obliged if any of your readers of WORK would say what kind of ink or paint is used in writing large posters, and also for window tickets."

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Distempering Wood.—F. P. writes in reply to BELL (see page 334):—"Mix 1 lb. patent size with three pounds best whiting, or similar proportions; if glue is used instead of size, consider it four times as powerful for your purpose as the size. You want to 'get up' and grain tables and bedroom suites cheaply, say, in imitation of oak. Proceed as follows: Put cold water into a vessel, then whiting into it and dry ochre sufficient to get the desired shade of ground when dry (determine this by trying a little). When all is moistened, pour off water, and add the hot glue or size. Well stir and strain through a sieve or such like. Dust the articles, and coat with mixture. When dry, give another good coat; this should give, when dry, a hard, solid surface. Well rub down with glasspaper to get a smooth surface (don't rub it all off!), and then grain on it, using water ground pigment in a little beer, and wiping out figure and grain with a stiff brush and wet chamois leather. When dry, give a coat of 'half and half,' turps and varnish; then overgrain, if required, and finish with a good coat of varnish. Any other wood and 'mottling' imitation is done in water. Colour upon the size ground in similar manner; but remember, as in all things, 'practice makes perfect!'"

Trade Notes and Memoranda.

THE 111-ton gun was fired recently at Shoeburyness, and a few results may be interesting. Six rounds, each costing £108, were fired, and projectiles weighing 18 cwt. fired by 960 lbs. of pebble powder were sent twelve miles. The approximate initial velocity was 1,850 ft. per second. The gun was fired by electricity. The concussion broke many windows in the barracks and houses in the village, which is more than half a mile from the battery. A large number of well-known artillerists were on the ground.

A PRIVATE company has been formed, and has obtained the necessary capital for the construction of an electric railway from the town of Lanark to Hamilton. The motive power is to be obtained from Stonebyres, one of the Falls of the Clyde.

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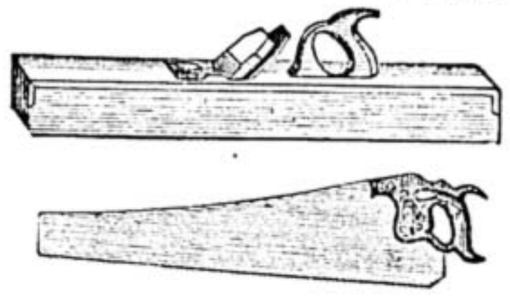

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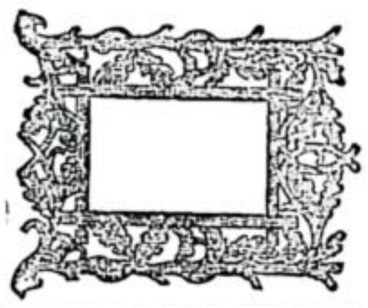

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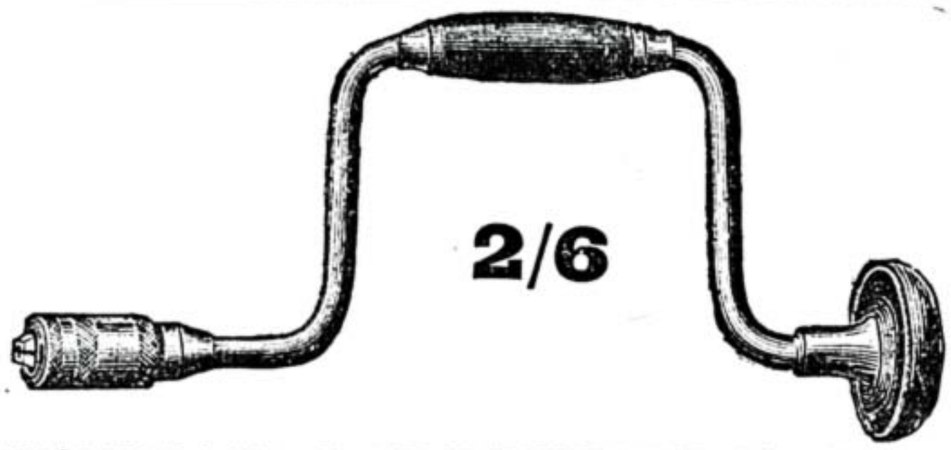

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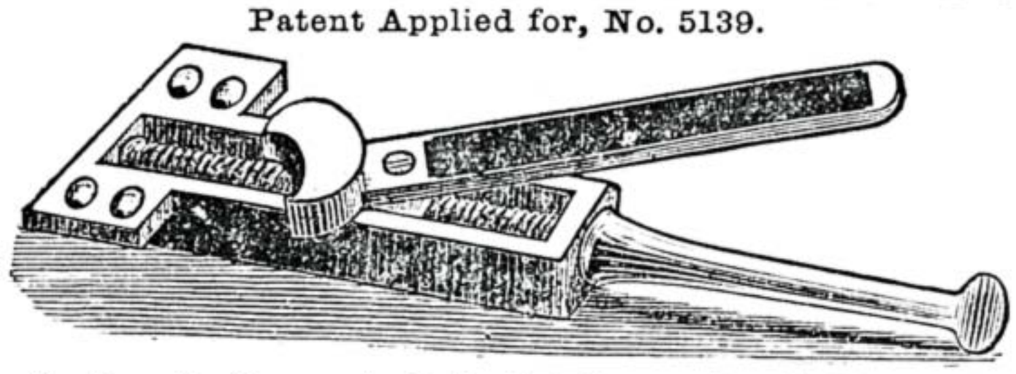

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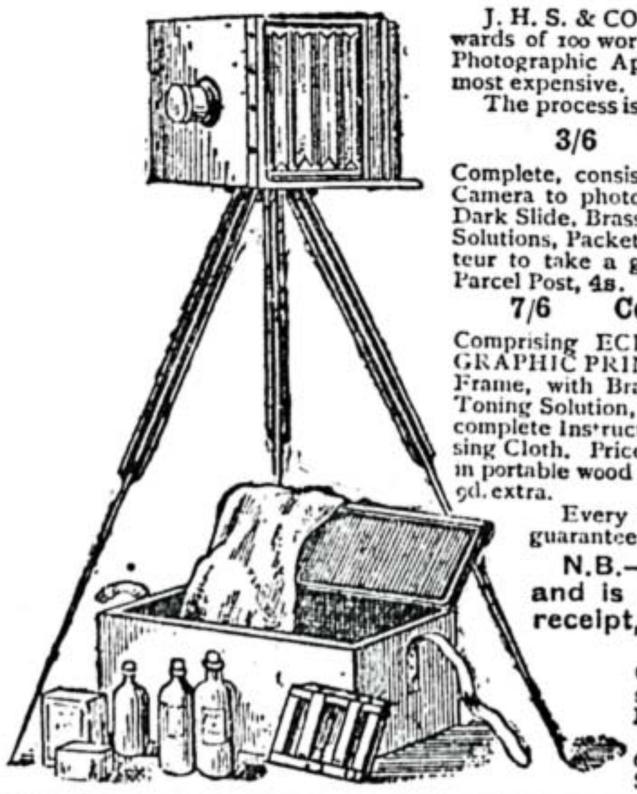

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